REMARKABLE ITALIAN MOTORSHIP DEVELOPMENT

NEW YORK SEATTLE

MOTORSHIP

Devoted to Commercial and Naval Motor Craft

"MOTORSHIP" is entered as second-class matter at the Post-office at New York, N. Y., U. S. A., July, 1918, under the Act of March 3rd, 1879.
Office of Publication, 1270 Broadway, New York, N. Y.

Issued Monthly
PRICE 25 CENTS
Domestic, $3.00 per year
Foreign, $3.50 per year

OCTOBER, 1920
Vol. 5 No. 10

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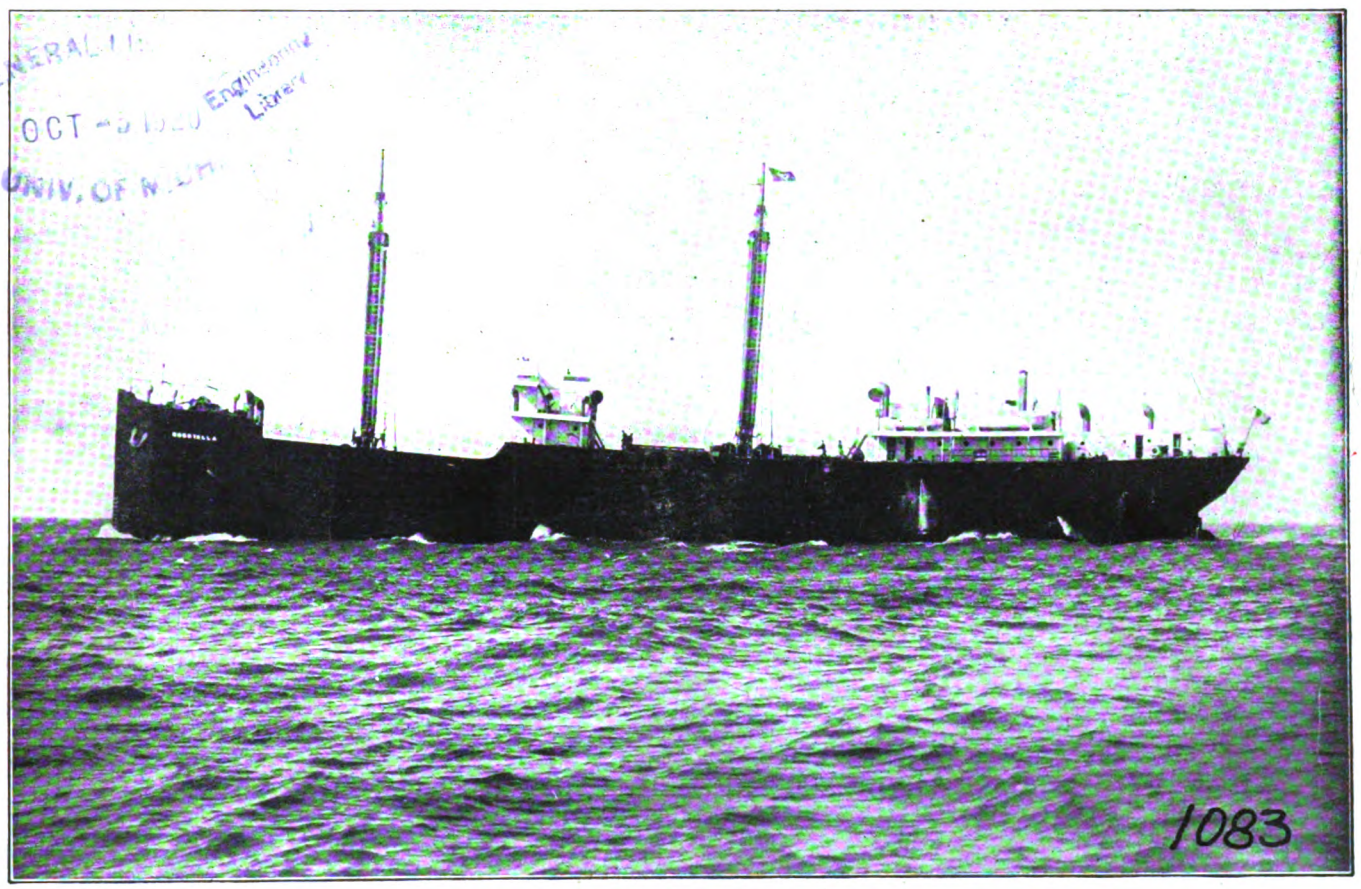

DIESEL MARINE ENGINES

FOR ALL CLASSES OF SHIPS

McINTOSH & SEYMOUR CORPORATION

AUBURN, N. Y., U. S. A.

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MOTORSHIP

Trade Mark, Registered

Published Monthly in the Interests of Commercial and Naval Motor Vessels and for Recording International Progress of the Marine Internal-Combustion-Engine

Head Office: 1270 BROADWAY, NEW YORK, N. Y.

149 California Street, San Francisco 71 Columbia Street, Seattle, Wash.

Published by MILLER FREEMAN & COMPANY

MILLER FREEMAN.....President
THOS. ORCHARD LISLE.....Editor
A. M. S. Naval Engineers. A. M. I. Marine Engineers
RUSSELL PALMER.....Manager
GEO. F. FARRAH.....Advertising Manager

Subscription rates: U. S. A. and Mexico, $3.00 per year. Canada and foreign countries in the postal union, $3.50. Single copies, United States, 25c. Great Britain, 1/6. Other countries, 35c.

"Motorship" is published on the 25th of the month prior to date of issue, and all changes in and new copies for advertising must be in the hands of the publisher prior to the 5th of each month. Notice of discontinuance of advertising must be given before the 1st of the month, preceding issuance.

EDITORIAL

STEAMSHIP CONTRACTS CANCELLED—MOTORSHIP ORDERS HOLD GOOD!

"There is a very black outlook in the British shipbuilding trade, according to the *Journal of Commerce* of Liverpool, and the falling-off of work at the shipyards on the northeast coast of England that has made itself manifest during the recent weeks is only the beginning of a much more serious state of affairs. Not only are orders for new steamships not being placed, but contracts which have been entered into for the construction of steam-driven craft have actually been cancelled, so that the outlook is as black as it possibly can be, and the coming winter will probably be the worst experienced for many years past." There was one exception, however, where the order for steam-turbine machinery was changed to Diesel-engines by the owners, who fully realized the great importance of economy.

In the face of this there is considerable significance in the fact that all the orders for large Diesel-driven motorships that have recently been placed in many of the leading British shipyards are holding firm, and that no cancellations have yet been received for this economical class of vessel. Altogether there is a very large number of motorships on order in the British Isles, and some of the latest vessels that have just run trials are illustrated in this issue. Most of the leading shipyards (about twenty altogether) have orders for two or more Diesel-driven motorships, and two Scottish shipyards have orders for five or over. Further comment is hardly necessary.

INFORMING THE NATION

So far we have heard of no attempt by marine oil-engine builders to get together as suggested in our last issue. It has since been proposed that a sub-committee could be formed at such a meeting to arrange for a series of educational "moving pictures" of some of the large foreign motorships that enter our ports in order to familiarize the nation with what our shipping competitors are doing, and also to show films of American Diesel-engine plants and motorships to illustrate what our factories can do if given proper support. These cinematograph films should include general views of the ships, interiors of the engine-rooms showing manoeuvring motions, erecting Diesel-engines in the shops, view of electrical deck-machinery, handling cargoes, anchors and steering-gear, and above all shaded diagrammatical sketches showing longitudinal sections of the ships together with similar drawings of steamships comparing the cargo-capacities and fuel-bunkers of both types and the advantages thereby gained by use of motor power. In direct contrast to the clean, cool engine-rooms of motorships, illustrations could be shown the hot, dirty stokeholds of steamers—many of which are living hells. Dock and ship disturbances among the firemen could be depicted such as often occur, and the total absence of that unruly factor with motorships explained. These pictures could be produced by such a concern as the Bray Studio, which makes a specialty of educational "movies," and shows them at picture-palaces all over the country. Managers of such houses would gladly run them if they were released to them without charge. Probably a small renting-fee could even be obtained if the films were made as interesting as they could be, and this would partly offset the original cost and distribution charges. When the members of the domestic Diesel-engine industry co-operate and set-about to assist the work now being accomplished by "Motorship," much progress will be accomplished. Let co-operation be the keynote of us all!

United States Senate,
WASHINGTON, D. C.

Marion, O., September 6, 1920.

Mr. Thomas Orchard Lisle,
Motorship Magazine,
1270 Broadway,
New York City.

Dear Mr. Lisle:

I am firm in my desire for an adequate American merchant marine. Any development of the science of ship building and ship operation, and any American achievement of science or the art of honorable trade which puts our ships upon the seas and our goods upon foreign soil, will have the friendship and aid of the Republican Party to the extent that I represent it.

Sincerely,

WGH

Merchant-marine policy of Senator Warren G. Harding, candidate for President of the United States of America

CARGO SHORTAGE AND ITS RESULT

At a time when several hundreds of the Shipping Board's steel steam-driven freighters are lying idle in New York and Norfolk harbors, unable to secure cargoes, the Italian motorship "Ansaldo San Giorgio I" arrived here—not only with her hold full-up to the hatches, but with her deck piled-up with cargo, even around the engine-room skylight. Furthermore, after unloading, she fully reloaded with American products and returned to Italy laden deeply in the water, while many of our own uneconomical steamship cannot get paying cargoes. It has been found that a Diesel-driven vessel of this type is from 50% to 60% cheaper to operate than an oil-fired steamer of similar dimensions and speed. Consequently, when the time and necessity comes for rate-cutting of freight-charges there can be no question as to what classes of vessels will be left rusting at their moorings. While we would prefer to see American ships carry American products, the Italian shipowners in question morally deserve to carry the goods, as through common-sense and foresight they have provided themselves with vessels that are superior for the purpose, meanwhile the majority of our own shipowners still refrain from building similar craft. Further information on this situation is given elsewhere in this issue.

REDUCTIO AD ABSURDUM

Apropos the reluctance of most of our shipowners to order new motorships, a paradox exists which reduces this attitude to a point that if not so serious would be amusing. Attempts have been made, we believe, to purchase some of the fine European Diesel-vessels now in service, but without avail, as owing to the remarkable earning-powers of such vessels there are no sellers except at prohibitive prices; yet undesired foreign *steam*ships are readily available to them at most moderate figures. Recently three old single-screw motorships, built in bygone days and converted from steam to Diesel power about six years ago were purchased by a prominent Norwegian shipowning firm, who has a branch in New York, at $240.00 per ton d.w.c. at a time when new steamships were selling on the market at $150.00 to $175.00 per ton d.w.c. If motorships are not thoroughly reliable and economical, why is it foreign owners will not sell to American capital, with money exchange rates in their favor? On the other hand, if they are so valuable, why don't more American shipowners build new motor-craft, incorporating all the benefits of European experiences? Have they no confidence in the ability of domestic ship and engine builders? If the answer to the latter is yes, we believe that a few personal visits to several of our principal Diesel-engine plants would inspire confidence in the skill of our engineers. The suggstion often made of lack of operators does not hold water, as the supply of experienced sea-going men exceeds the present demand.

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FIRST COST OF MOTORSHIPS

Shipowners who read the articles in this issue on motorshipping in Italy will be edified to know that a well-known Italian shipbuilding firm, constructing both geared-turbine and reciprocating steamships, as well as Diesel motorships, assert that a 8,100 tons vessel of the latter type only costs about one hundred thousand lira more than steam vessels. Seeing that the motorship actually carries about 1,000 tons more cargo than either class of steamship, it is obvious that the first-cost is really considerably less, if the net cargo-capacity or cubic-capacity of the holds is taken as a basis.

OIL COMPANIES AND MOTORSHIPS

American oil-companies who recently secured approval from the United States Shipping Board to build a total of nearly 30 steam-driven tankers under the tax-exemption privileges of Section 23 of the Merchant Marine Act can ponder a while with advantage on the action of several leading European motorship-owners. In order to avoid having the high cost of transportation of fuel-oil in steam-propelled tankships added to the price of fuel that they purchase from America or elsewhere, they are building Diesel-driven tankers for their own use, which by reason of their low operating-costs and comparative large capacities will carry oil across the Atlantic at a minimum expense. Or, should these shipowners be unable to secure liquid-fuel at reasonable cost in Mexico or the U. S. A., these motor-tankers will be able to proceed to any part of the world for cargo where oil is more plentiful and cheaper, because of their low bunker consumption.

The East Asiatic Company, The Societe Nazionale di Navigazione and the Rederiaktiebolaget Transatlantic have recently built or are now building large Diesel-motor tankers with the above object in view, and a number of other leading European motorship owners are very seriously considering making similar provisions for the future. Consequently, if our oil-companies are interested in increasing and maintaining their foreign business all new tankers should be Diesel-driven in order to reduce transportation costs.

We are of the belief that every additional steam-driven tanker built for overseas service is a handicap for future bunker-supply trade. Because in addition to this competition, our oil companies will have to face, before very long, competition from European oil-interests, one great Dutch-British oil-company alone having recently augmented its motor-tanker fleet to a total of over 30 motorships, some of which they acquired from the British navy. Another British oil-concern recently took delivery of the first of a fleet of six 10,500 tons d.w.c. Diesel-driven bulk-oil carriers for its trans-atlantic service and the British subsidiary of the Standard Oil Company recently took delivery of the first of a pair of similar sized Diesel motor tankers, and the German subsidiary has one of 15,000 tons in service.

As our oil-companies apparently are now having such difficulty in supplying the demand for bunker-oil, one would expect them to do everything to economize its use and set an example by building Diesel-driven tankers, instead of oil-wasting steam-propelled craft, which later-on they may be obliged to convert, or relegate exclusively to coastwise services. Much, of course, depends how important the foreign business is regarded by our oil-companies—not now, but several years hence.

ANOTHER STEAM TANKER TO BE CONVERTED

Now under construction at the works of the North British Diesel Engine Co. is a 6-cylinder 4-cycle type Diesel-engine of 1,750 i.h.p., which we understand is to be installed in a tanker owned by Lane & McAndrew of London, to take the place of the existing steam-engines and boilers. We were given this information when in England last August, but by request refrained from publishing it.

ENGINE CREWS FOR MOTORSHIPS

There is not the slightest doubt but that the supply of skilled operators of marine Diesel-type engines now exceeds the demand, and many excellent engineers are obliged to take jobs aboard steam-driven vessels. Our Register of marine Diesel engineers is increasing each month, and to any shipowner who is doubtful about the motorship engineer situation, we would be glad to forward a complete list of names and addresses of these men. As we write we have before us a letter from the Marine Department of one of the largest American oil-companies in which they state that at the present time they have full crews on all their motorships, and therefore it is impossible to take on additional men. We already have referred to the statement of Captain J. D. Norton of the U. S. Shipping Board, 45 Broadway, New York, in which he avers that at present there is no demand for capable operators trained in Diesel-engine work, and that the Shipping Board has several fine men whom they specially trained, but for whom they can find no positions in the private merchant-marine.

MOTORSHIP TRANSPORTS COAL 10,000 MILES

Another evidence of the remarkable transportation qualities of Diesel-driven motorships is to be found in the shipment of 4,500 tons of coal, from Vancouver, B.C., to Sweden aboard the Swedish motorship "Pacific" by W. R. Grace & Co. of New York, agents for the Johnson Line (Nordstjernan Line) of Stockholm. This is a distance of practically 10,000 miles and is a world's record. It is obvious that such a shipment was only possible by reason of the economical operation of the motorship, and would have been an unpractical commercial proposition with an American oil-fired steamship.

Motorship of 6,500 Tons Weight-Capacity for Alaska Steamship Company

Steel Vessel Ordered from Todds Dry Dock to Have Twin 1,200 i.h.p. McIntosh & Seymour Diesel Engines

SIGNIFICANCE is to be found in an order for a large steel Diesel-driven motorship placed by a prominent Pacific coast firm at a time when dozens of wooden steam-driven craft are lying idle in local harbors, and which can be obtained for practically a mere song. That the firm, hitherto operating steamships, is connected with the Guggenheim interests increases the importance of this order.

We refer to the Alaska Steamship Company, Seattle, Wash., who have announced that it will at once have built a large motorship for South American and other foreign trades. The contract for the hull and for the installation of the Diesel engines, machinery and equipment has been let to the Todd Dry Dock & Construction Corporation, and the keel will be laid down at the big Tacoma plant just as soon as material can be assembled. The contract for the winches and other electrical machinery also goes to a local firm, the Allan Cunningham Company.

The news is of great interest to shipping men, as this will be the largest motorship to be ordered, and will be the pioneer in the development of this class of vessel, on this coast. The Alaska Steamship Company is distinctly a Pacific coast organization, for many years engaged in the important industrial development of Alaska, and now planning to extensively engage in foreign trade. The completed plans show a well-proportioned and graceful ship. Then the new vessel will present many novel features, such as its complete electrically-driven auxiliary machinery, the arrangement of quarters for officers and crew, her efficiency, combined with economy, and her large cargo-capacity in comparison to its dead-weight tonnage.

She will be an all-steel motorship, built to Lloyds 100-A-1 Class, or its equivalent. Primarily the vessel will be used in the South American and foreign trade, but, being designed to carry heavy bulk-cargo, she can be utilized in any freight service where it may be required. She will have twin-screws, and when loaded is expected to develop a speed of better than 11 knots on a fuel-consumption of about 7 tons per day. Her principal dimensions will be:

Weight capacity	6,500 tons
Length over all	About 360 ft.
Between perpendiculars	345 ft.
Beam molded	49 ft. 6 in.
Depth molded	26 ft. 9 in.
Draft loaded	22 ft.
Power	2,400 i.h.p.

Two McIntosh-Seymour four-cycle type Diesel engines, each having 6 cylinders and developing 1,200 i.h.p. at 140 revolutions per minute will constitute her propelling power. Sectional bronze propellers will be installed on the vessel.

The net cargo-capacity will be about 6,500 weight tons. In lumber it will be represented by 3,250,000 feet. The entire vessel will be constructed with heavy steel double-bottom, and the cubic-space between the bottoms will be utilized for the storage of fuel-oil. The amount of fuel-oil that the vessel can carry in her tanks is another distinct feature of the craft. These tanks provide space for 1,500 barrels of fuel-oil and 4,500 barrels as oil-cargo, a total of 6,000 barrels, or, at her average estimated consumption, enough to carry the vessel a distance of fully 26,000 miles.

No steam will be used on this vessel, another unusual feature with American ships. All the auxiliary machinery and equipment will be electrically driven. The electric energy will be generated by two auxiliary 100 b.h.p. McIntosh-Seymour Diesel engines, and

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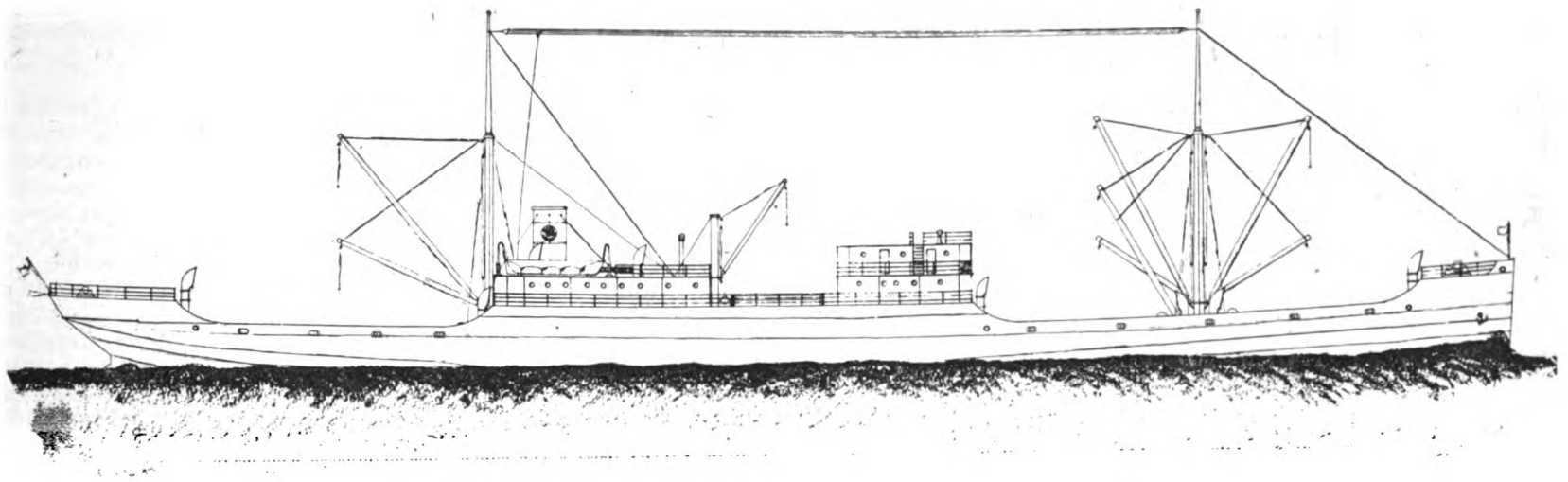


Profile plan of Alaska Steamship Co.'s new 6,500 tons d.w.c. motorship. Twin 1,200 i.h.p. McIntosh & Seymour Diesel-engines will be installed

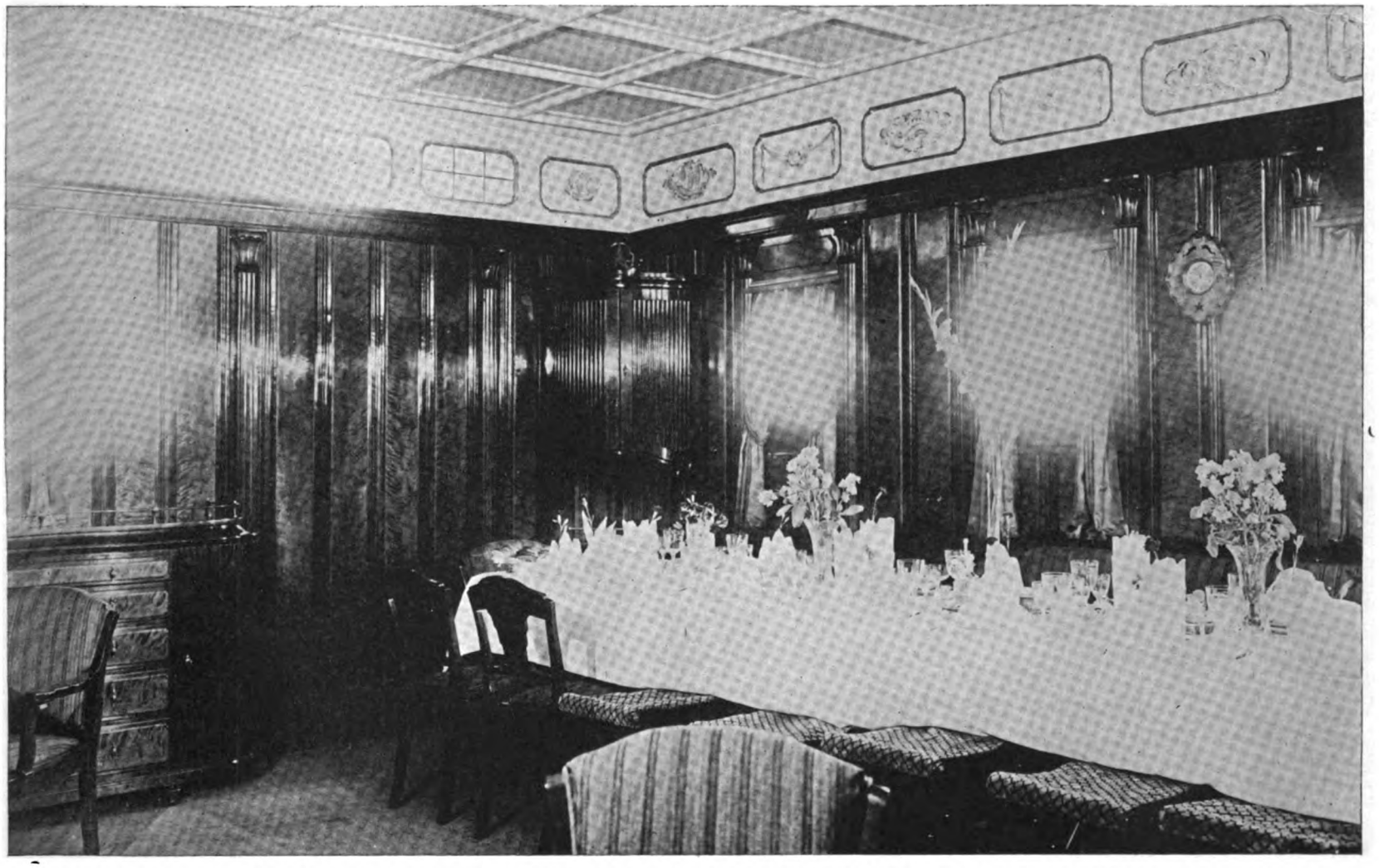
this power will drive the winches, windlasses, steering-engine, electric-light, towing-engine, ice-machine, pumps, air-compressor and all other auxiliaries.

Her hull will be constructed on the Isherwood longitudinal system, and there will be four cargo-holds, three 'tween-decks and one large bridge 'tween-deck. The vessel will have two masts, two derrick posts, nine booms, eight winches, four large hatches 18 ft. by 28 ft. Eight of the booms are for lifting from five to ten tons each, but one special boom is designed for lifting thirty tons.

The engine-room will be set two-thirds aft. All housing space for officers and crew will be directly amidships, and here, too, some decidedly novel and interesting details are observed. On the navigating bridge will be found the wheel-house, chart-room, commanding officer's suite consisting of office, stateroom and bath; owner's room with bath, and pilot's room. On the bridge-deck the quarters are most conveniently arranged fore and aft of No. 3 cargo hatch. In the forward section are located the main dining-room, chief-engineer, first-engineer, chief-officer, second-officer, third-officer, purser, steward, bathroom and officers' smoking-room. This room will be used as a library and social hall and is an innovation among freighters. It will undoubtedly be much appreciated by the officers. The after-house has the hospital, the seamen's mess, engine-room mess, staterooms for second and third-engineer, radio-room, quarters for seamen, oilers, wipers and others, each group having its own separate bath, which is still another improvement.

Hot and cold running water, electric-heat, modern plumbing in every respect, the latest cold storage and wireless equipment will complete the most livable quarters yet arranged for any freighter on this coast.

The Alaska Steamship Company during the past two decades has pioneered the way and has largely assisted in the development of traffic and expansion of routes in the Northern territory. Now, by this latest contract placed with local companies, it will be the pioneer in still another field. For that reason the building and subsequent career of this large steel motorship will be watched with interest by all who follow the development of Puget Sound commerce, particularly as this vessel is to be built for foreign trade, and will prove to be an important factor in the expansion of the company's plans.



Combination passenger-and-cargo motorships of from 12 to 16 knots speed are the ideal ships for America's merchant-marine. The above illustration shows the passengers' dining-saloon aboard the Nordstjernan Line (Swedish) motorship, "Buenos Aires," 9,300 tons d.w.c., built and Diesel-engined by the Götaverken of Göteberg for service between Sweden and North and South America

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British 14,000 Ton Motorship "Glenogle"

New Harland & Wolff Vessel of 6,600 i.h.p. and 14-Knots Speed

THROUGH the courtesy of Harland & Wolff, of Belfast, we are enabled to give an excellent illustration of the new combination passenger-cargo motorship "Glenogle" that they have built for a prominent British shipowning firm, and which is the second vessel of this size completed—while the third ship was launched on July 14th last, and two additional sister motorships are now under construction.

These vessels are to the order of the Glen Line, of London, and will be engaged in the London to Far-East service. As we recently mentioned, we understand that the first vessel, the "Glenapp," has been turned over to the East Asiatic Company, but no official confirmation of this has yet been issued. The "Glenogle" has the following dimensions, which we repeat from our September issue:

Displacement (loaded)	About 19,000 tons
Dead-weight capacity	14,000 tons
Length (o.a.)	502 ft. 0 in.
Length (b.p.)	485 ft. 0 in.
Breadth	62 ft. 2 in.
Draught (loaded)	27 ft. 2 in.
Power	6,600 i.h.p.
Twin or single screw	Twin
Type of Diesel-engine	Four-cycle
Loaded speed	13 to 14 knots
Gross tonnage	9,150 tons
Daily fuel-consumption	20 tons
Bunker-capacity	1,300 tons

Whether or not she will be run at the full speed of 14 knots we are not certain at this time, but we presume it is more likely she will be run at 13 knots loaded, in which case her fuel-consumption will be about 18 tons per 24-hour day. Her twin Diesel engines are of the four-cycle type, with eight cylinders each, and are of Burmeister & Wain design, constructed at one of the three Glasgow Diesel engine works of Harland & Wolff.

At the after end of each engine there are two air-compressors mounted in tandem and driven-off the extension at the after end of the crank-shaft. While these engines are very similar in power to the Diesel engines installed in the "Glenapp," the bore and stroke is a little different, being 740 mm. bore by 1,150 mm. stroke, while the "Glenapp" engines had a cylinder bore of 750 mm. by 1,100 mm. stroke. Another change is the use of fresh-water cooling for the pistons. Four furnishing power for the auxiliary machinery there are four Diesel-engines of 150 b.h.p. at 300 r.p.m., each coupled to a 95 k.w. electric-generator. These are all arranged on the port side of the engine-room. In addition there are two 180 h.p. motors, each operating an air-compressor which furnishes air for manoeuvring the main engines at 25 atmosphere. It is interesting to note that the thrust-blocks are the Michell type, which are the British equivalent to the well-known American Kingsbury thrust-block which is also used on motorships.

Motorship Fleet of British India Steam Navigation Company

A Total of Eight New Diesel Vessels Building

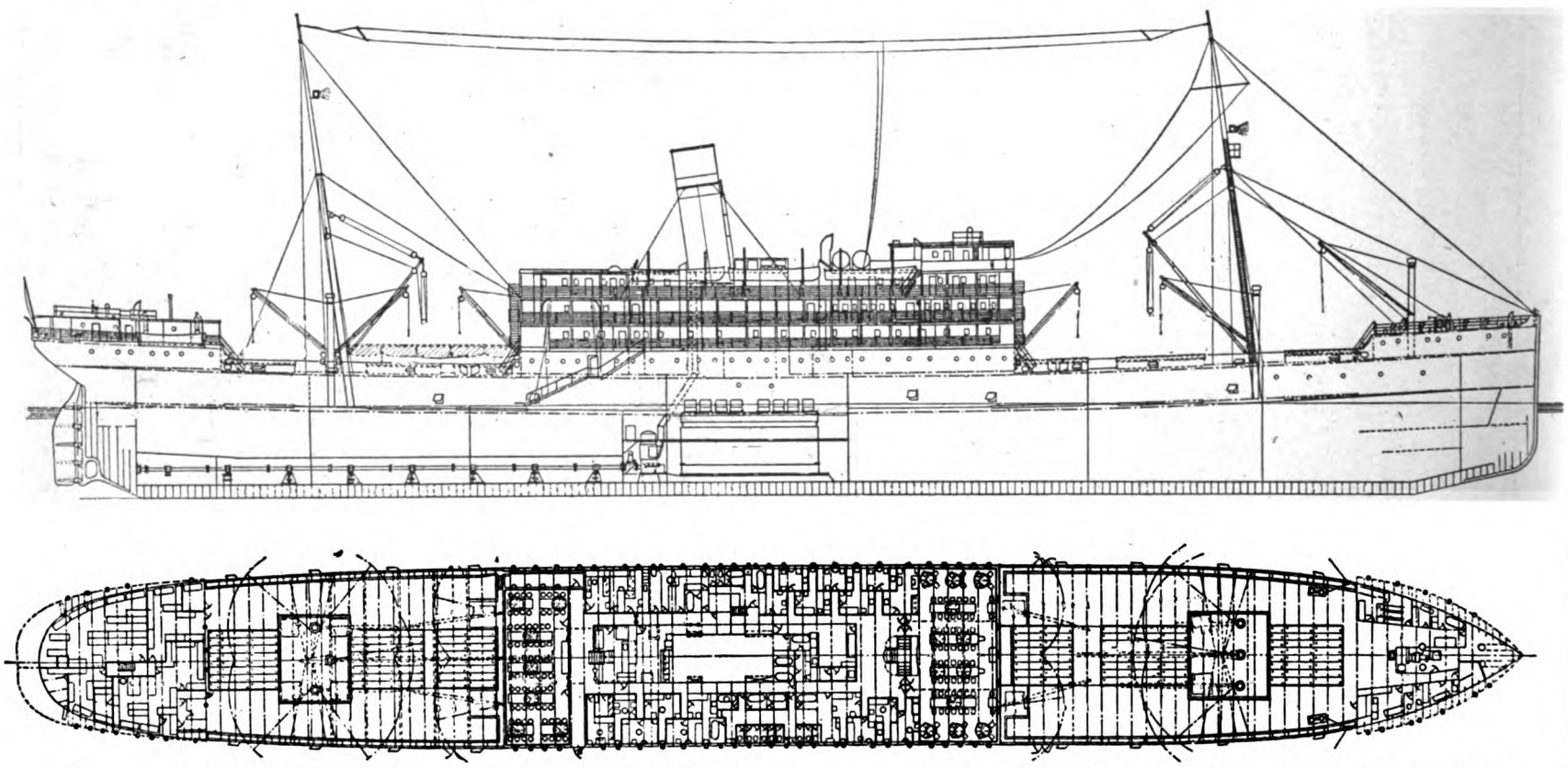
IN the special European number of "Motorship," which readers may remember was published in November, 1919, we were enabled to give the first announcement regarding the fleet of four twin-screw Diesel motor passenger-liners that were on order for the British India Steam Navigation Company, of which one vessel presumably is to be turned over to the Union Steamship Company of New Zealand, which is a subsidiary concern also controlled by Lord Inchcape.

These vessels are to have a total power including auxiliary engines of 6,000 i.h.p., consisting of two North British four-cycle type Diesel propelling engines of 2,330 i.h.p. at 96 r.p.m. and four auxiliary Diesel engines totaling 1,400 b.h.p. One of the auxiliary engines was illustrated on page 811 of our September, 1920, issue.

These vessels differ from motorships now building, inasmuch as they are intended principally for passenger traffic and not mainly for freight with passenger accommodation. But, of course, they will carry a certain amount of cargo. As previously mentioned, the British India Steam Navigation Company have ordered a fifth motorship, which will differ from the others, inasmuch she will be fitted with two-cycle type Diesel engines, whereas other vessels have four-cycle type Diesel machinery. Furthermore, the order has been placed with a Scottish shipyard that has only just turned its attention to the construction of Diesel engines. We refer to the firm of Alexander Stephens & Sons, of Govan, Glasgow, an old-established steam-engine and shipbuilding concern who recently acquired a Diesel engine constructional license from Sulzer Frérés, of Winterthur, Switzerland. They are proceeding to construct the engines and install the machinery in the vessel for this well-known British Steamship Line. Her dimensions are as follows:

Length (b.p.)	430 ft.
Breadth	54 ft. 6 in.
Draught	25 ft. 3 in.
Power	3,200 s.h.p.

She is a twin-screw ship, and each propelling Diesel-engine develops 1,600 shaft h.p. from four cylinders working on the two-



"Magnavana," the British-India Steam Navigation Co.'s 13 knots passenger-cargo motor-liner, propelled by two North British four-cycle Diesel-engines. Every auxiliary aboard her, including the big cooking-ranges, will be electrically operated. Note her great cargo and passenger capacity. Seven other Diesel-ships are building for the same company

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cycle principle. Each engine has a three-stage compressor for fuel-blast and manoeuvring-air, but scavenging-air is furnished from an electric-driven Turbo-blower in connection with the latest Sulzer practice. The engine-room auxiliaries and the deck winches and steering gear are all electrically-driven—power for current generation being furnished by auxiliary Diesel engines. There will be a small vertical boiler for steam heating, etc.

A very interesting point in connection with this ship is that when the order was originally placed reciprocating steam-engines were to be installed. Later the owners ordered a change to oil-fired geared-turbines. But this was followed by the present change to Diesel engines, illustrating the trend of shipping progress now current in Great Britain. We are indebted to Messrs. Stephens & Sons for the information concerning this vessel.

We give an illustration of the British India Steam Navigation Co.'s motor passenger liner "Magvana"—which is the first of this fleet, and it is well worth noticing that her machinery space is only 56 ft. long, allowing maximum of passengers and cargo to be carried. This is one of the ships to have North British four-cycle type Diesel engines.

Finally, we will mention that these enterprising ship-owners have recently ordered three more motorships: two are to be built by Chas. Hill & Sons, Ltd., of Bristol, England, and one by Wm. Denny & Bros. of Dumbarton, Scotland. Their loaded displacement of the Hill ships will be 2,050 tons, and two North British Diesel engines of 600 i.h.p. each at 165 r.p.m. will be fitted. A speed of 11 knots is expected, and the ships will be used in the East African coastwise trade.

Bibby Lines Motorships "Dorsetshire" and "Somersetshire"

Two New Twin-Screw Diesel-Driven Vessels of 12,000 Tons d.w.c.

TO-DAY motorship and Diesel engine construction is the most active and prosperous branch of the British merchant shipbuilding industry, and as indicated elsewhere in this issue recent contracts for steam-driven vessels are being cancelled in rapid succession, or else their machinery specifications changed to Diesel power, while orders placed some time ago for motorships are holding very firm. If it were not for the numerous motorships under construction, a few months would see stagnation in the British shipyards.

Readers of "Motorship" are acquainted with the fact that the well-known Bibby Line have adopted Diesel motorships, and the first of these boats—a 12,000 tonner, "Dorsetshire"—ran trials off the Irish coast on August 14th last. She was built at Harland & Wolff's Belfast yard, and equipped with twin-screw Burmeister & Wain type Diesel machinery built at one of Harland & Wolff's plants in Glasgow. Her dimensions are as follows:

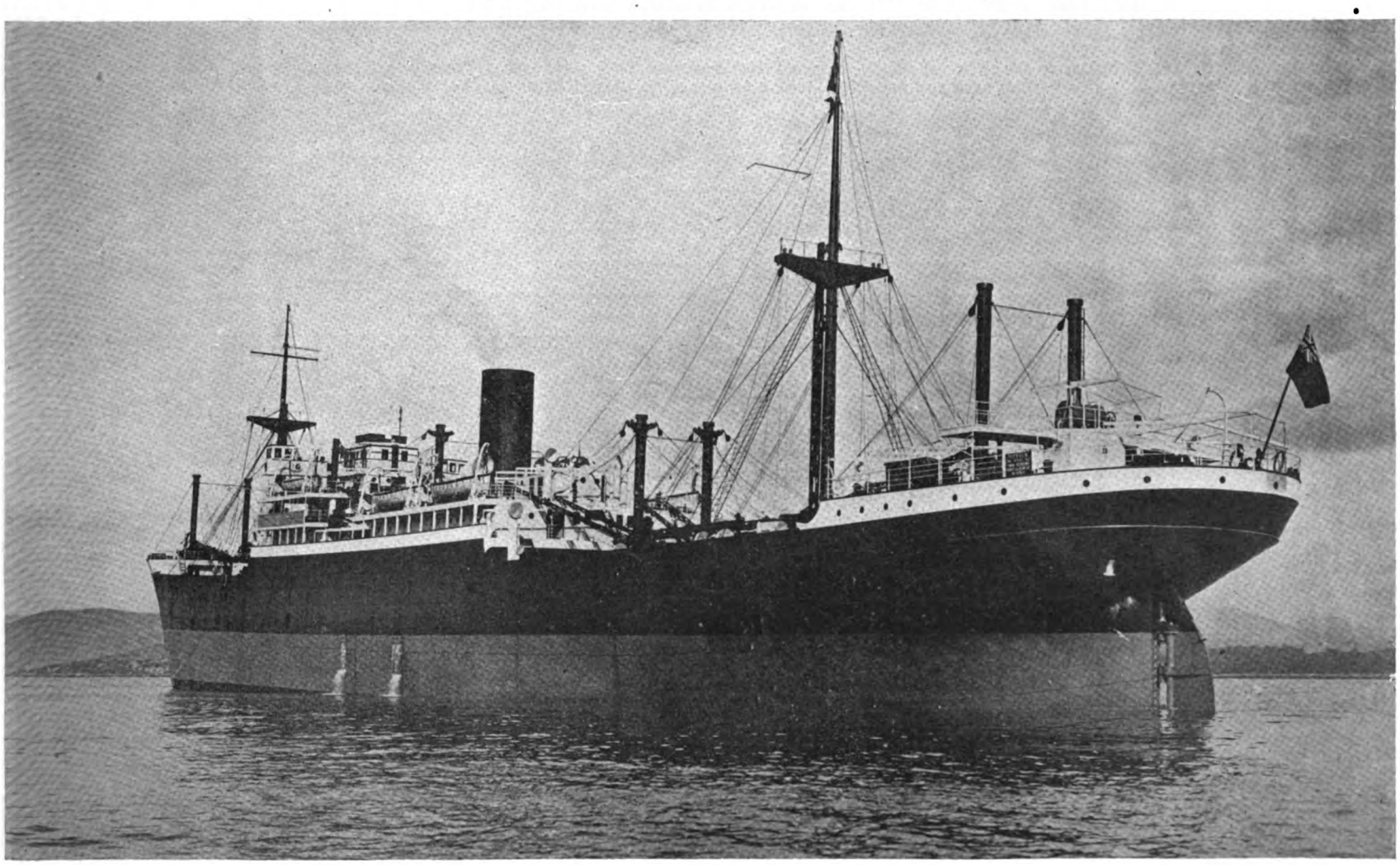
Dead-weight capacity	12,000 tons
Length (b.p.)	450 ft. 0 in.
Breadth	57 ft. 3 in.
Depth	33 ft. 7 in.
Power of main engines	4,500 i.h.p.
Power of aux. Diesel engines	600 b.h.p.
Speed	12 knots
Gross tonnage	7,500 tons
Engine-speed	115 r.p.m.
No. of cylinders per engine	6
Bore and stroke	29.134 in. by 45.275 in.
Daily fuel-consumption	14 tons

Accommodation is provided for twelve passengers, but she is mainly intended for transportation of freight. There is a double-bottom extending fore and aft for the oil-fuel, ballast-water and fresh-water. The forward and after peak tanks also carry water or fuel, and there is a fuel-oil tank between the shaft tunnels in No. 4 hold. As she will be engaged in the England to Far East service, she will bunker for round voyages at ports near the source of oil-supply, where the lowest prices can be obtained.

All the auxiliary machinery is electrically driven, there being three four-cylinder, four-cycle type 200 b.h.p. Diesel engines coupled to 100 k.w. generators. There are ten electric winches on deck, an electric windlass and a hydro-electric steering-gear. In the engine-room the equipment includes three 30-ton fuel-pumps, 20-ton E. W. Pump, C02 compressor, piston-cooling pumps, two manoeuvring-air compressors, steam-driven air-compressor, circulating and sanitary pumps, and a 23 b.h.p. turning-gear motor. On the same berth as the "Dorsetshire" was built, the sister motorship "Somersetshire" is now being plated and soon will be launched. The foregoing description will apply to this second vessel.

DIESEL PLANT OF HARLAND & WOLFF TO BE DOUBLED

According to Lord Pirrie the present large Diesel engine works of Harland & Wolff in Glasgow will be doubled within two years—a sign of the times!



"Glenogle," the Glen Line's new 14,000 tons d.w.c. 14-knot motor-liner. She is propelled by twin 3,300 i.h.p. British-built Burmeister & Wain Diesel-engines, and is a Harland & Wolff production. She is one of five sister motorships, and the first, the "Glenapp," has been in service for about three years. The third of this remarkable fleet was launched on July 14th last

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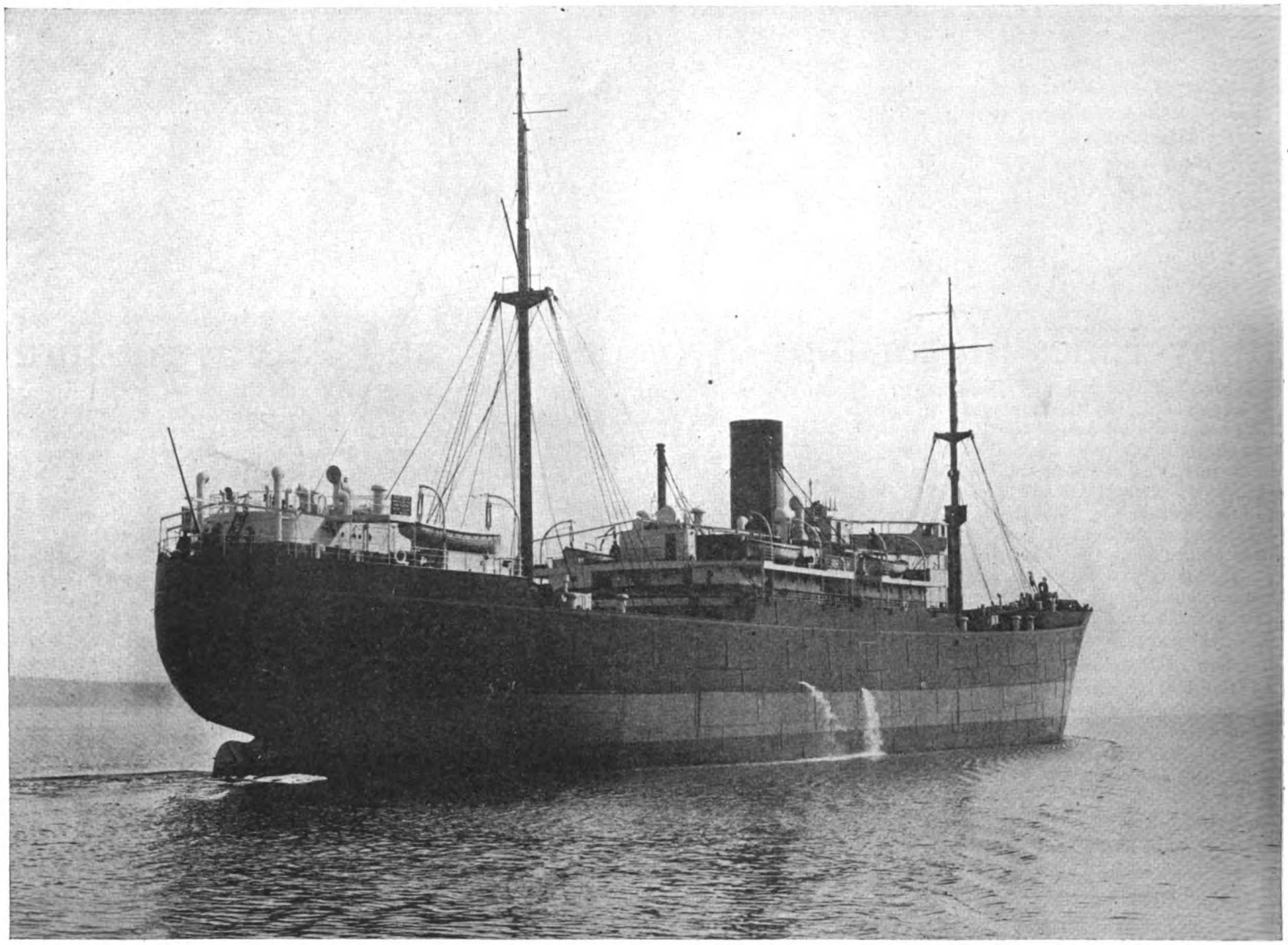
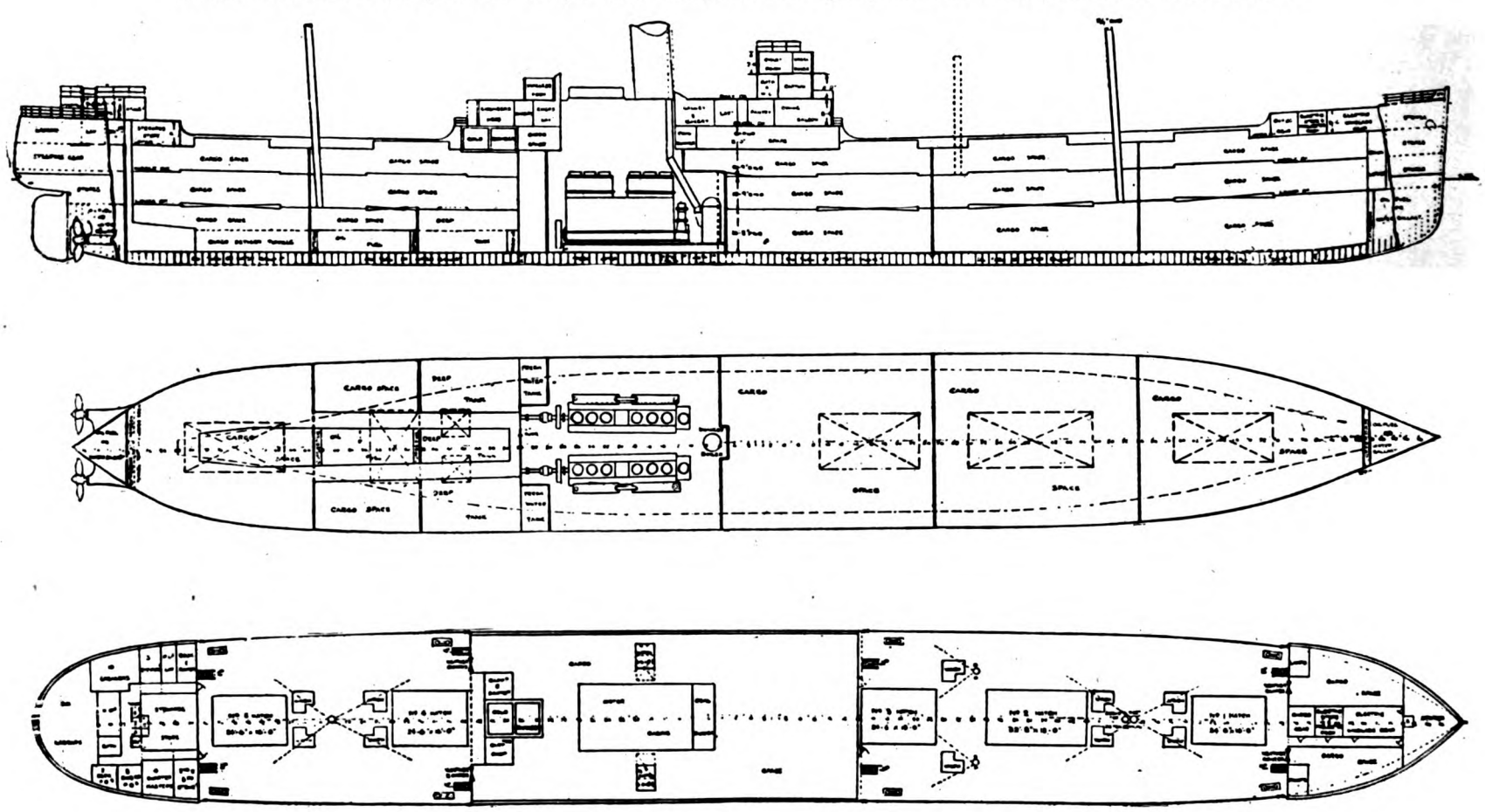


The Bibby Line's new 12,000 tons d.w.c. Diesel-driven motorship "Dorsetshire." A sister motor vessel is under construction. She was built at Harland & Wolff's Belfast yard and has 4,500 i.h.p. in twin-screws. Speed, 12 knots. Trials were run on August 14th last



General arrangement plans of the Bibby Line's new 12,000-ton motorship "Dorsetshire" illustrated above. Note the small amount of space occupied by her machinery and the utilization of the sides of the after part of the engine-room for fresh water tanks

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What Italy Has Done and Is Doing

Voyage on the Motorship "Ansaldo San Giorgio I"—Comparison with a Sister Geared-Turbine Steamer

OUR exclusive announcement last month that six 16-knot 12,000 tons motorships are to be built for the Societa Nazionale di Navigazione of Genoa, Italy, by Ansaldo-San Giorgio Ltd. of Spezia, evidently has taken American shipping and shipbuilding interests by surprise judging by the stir which it caused, and it is to be hoped will be the means of similar activity in this country. We will add to this news by stating that Ansaldo-San Giorgio Ltd. are also building a

Commendatore Pio Perrone, head of the great Italian firm of Gio Ansaldo & Co., of Genoa

twin-screw motorship of 15,000 tons d.w.c., to be propelled by two six-cylinder 2,000 shaft h.p. Diesel engines, and are about to lay the keels of two 9,000 tons motorships. In addition they are building three motorships of 8,100 tons d.w.c., one of which is a tanker.

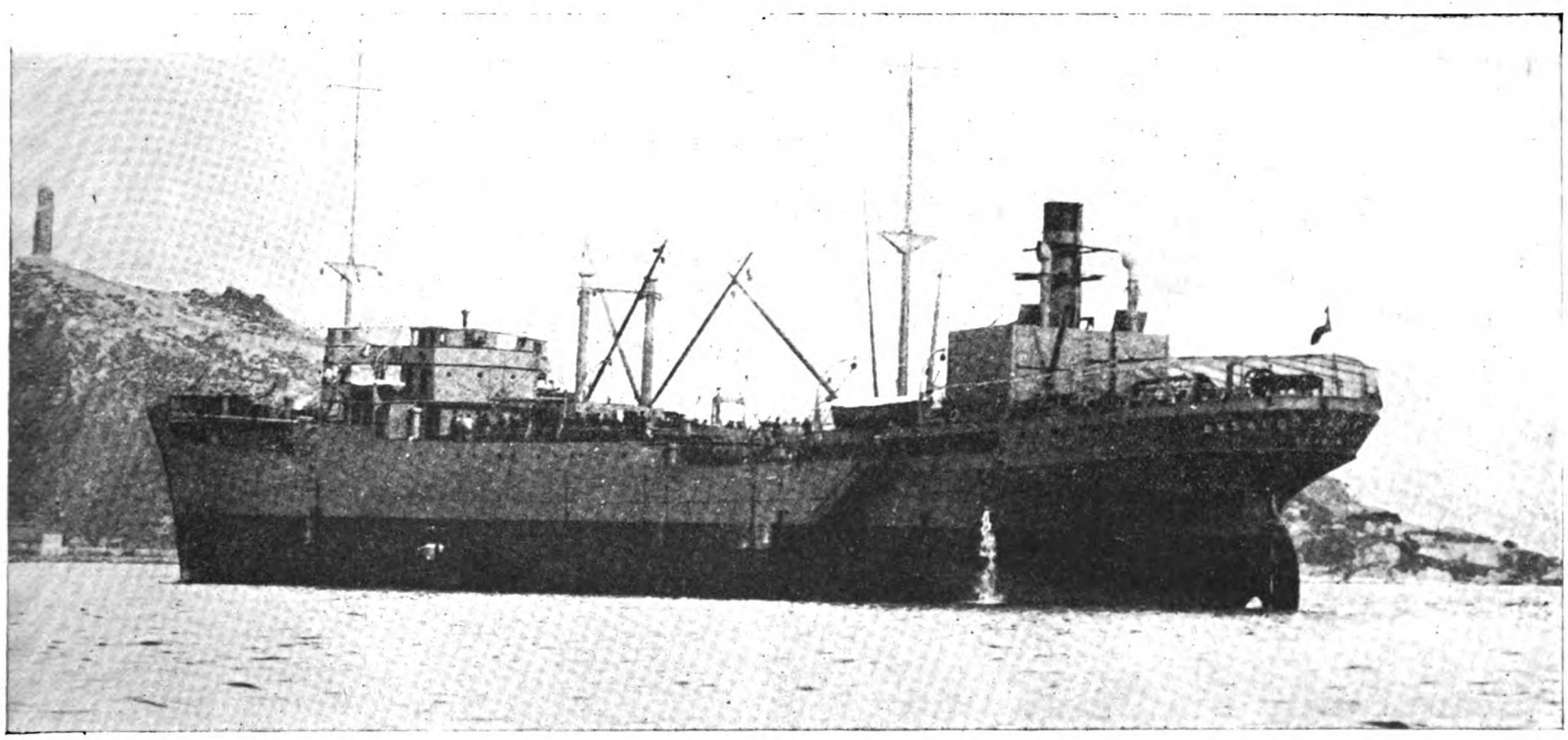
That all these vessels will have two-cycle engines brings this type of Diesel-engine into special prominence, assisted by the international controversy on the subject now running in our correspondence columns between engineers. Realizing that these Italian shipowners would never have taken such an important step as to order six high-powered craft (8,000 shaft h.p. in twin-screws is quite a record for single-acting motors), unless experiences with their three ships in service had left them unshaken in their faith in the reliability of the two-cycle system, we decided that the present time is very appropriate for an impartial and unbiased study of its operation under regular sea-going conditions.

Through the courtesy of the owners, and the Captain and Chief-Engineer of the Italian two-cycle Diesel-engined motorship "Ansaldo-San Giorgio I" we were enabled to make an observation trip from New York to Philadelphia, and details of the voyage are given towards the end of this article. This vessel is the first of three sister motorships in the service of her owners who also have a number of turbine-driven steamers of the same size in service. For instance, "Ansaldo San Giorgio" numbers I, II, and III are Diesel-driven, while IV, V and VI are steamships and VII, VIII and IX are also Diesel-propelled. The first was placed in service in the Spring of 1919, and the entire fleet was planned and commenced during the war under the title of "Italy's Emergency Fleet" at a time when merchant ships were most urgently needed, and at a time when our Shipping Board would not take the "risk" of adopting the most desirable power, but instead saddled us with two thousand steel and wooden steamers of which hundreds today are too uneconomical to operate and in consequence are a debt on the nation—a debt that will be considerably augmented in a few years when they are in service competing with motorships.

The arrival of peace changed the plans of the owners of these Italian motorships and instead of concentrating all efforts on the 11-knot 8,100 ton craft they have ordered the 12-knot 15,000 ton boat, the six 16-knot 12,000 tons passenger-cargo vessels, and the two 9,000 tonners referred to; these fitting-in better with post-war shipping developments and will be type of ships that will have no peer in engineering advance and in economy when they are ready for sea, unless the two 12,000 shaft h.p. German Diesel engines are installed in hulls by then. Figure it out—16 knots or better on a consumption of 37 tons per 24 hr. day and a cargo-capacity of 1,500 to 2,000 tons more than a steamer of the same overall dimensions and speed! Thus altogether they

Commendatore Mario Perrone, Director of Gio Ansaldo & Co., Italy

will soon have a fleet of 15 motorships of 156,600 tons d.w.c. aggregate, capable of transporting a total of 147,000 tons net cargo (exclusive of bunker-oil), per one-way voyage or 19,000 to 20,000 tons more cargo than 15 steamships of the same characteristics could carry. The aggregate fuel-consumption of this big fleet will be under 330 tons per 24 hr. day, and the total power will be 71,200 shaft h.p. Here is economy in reality. When all American shipowners realize the enormous



The "Ansaldo San Giorgio I," 8,100 tons d.w.c. She was laid down during the war as the first of Italy's "Emergency-Merchant-Fleet"

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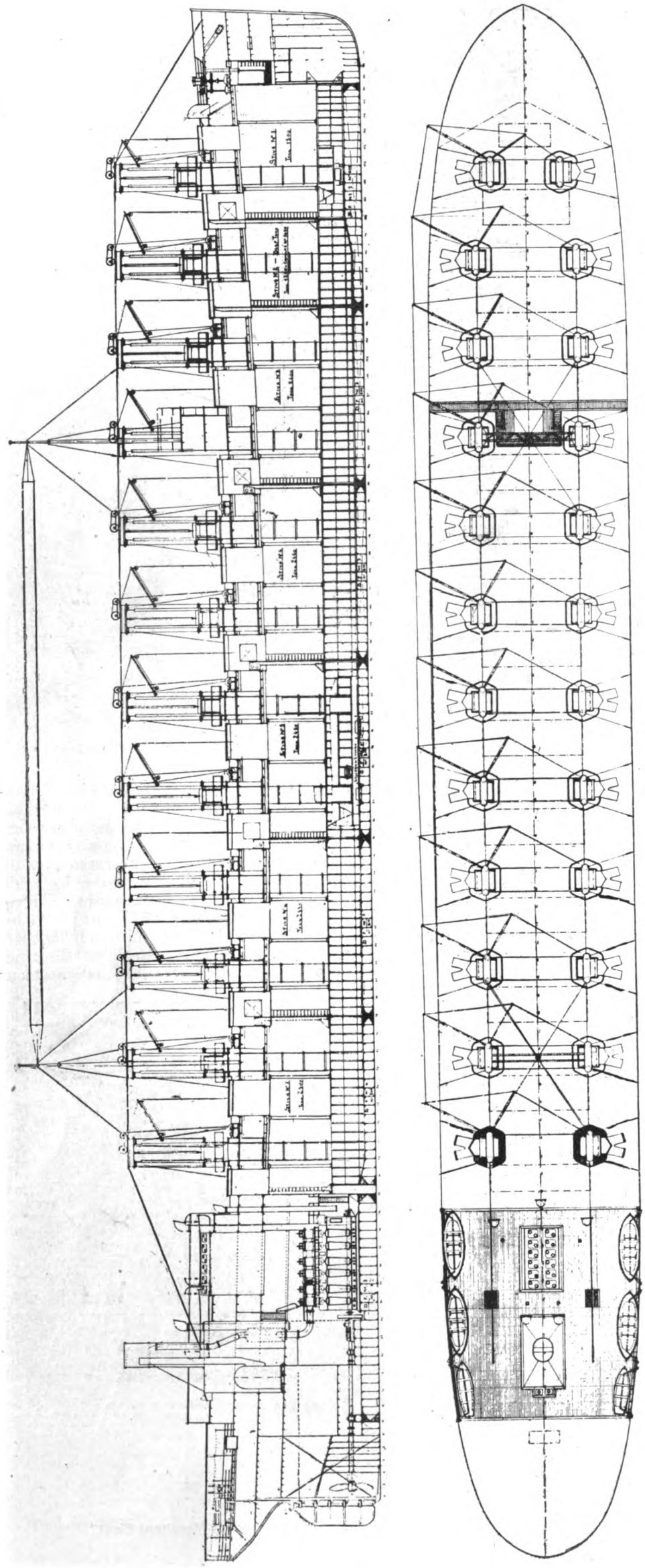
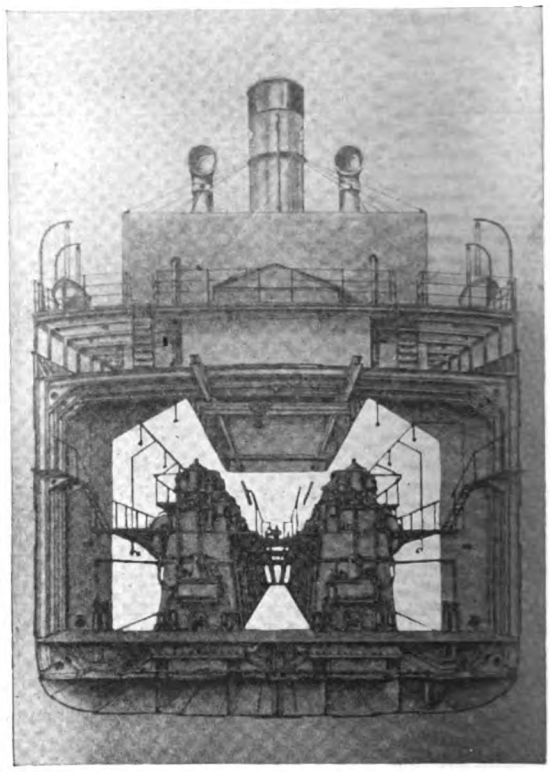


This remarkable 15,000 tons cargo motorship now completing at the Ansaldo San Giorgio yard, Muggiano, Spezia, represents the latest word in freighter construction and only will be surpassed by their 12,000 tons, 8,000 shaft h.p. 16-knot passenger-cargo Diesel motor-liners now to be laid down. The above vessel is of 4,000 shaft h.p. in two two-cycle Diesel engines

economies to be effected by a fleet of motorships and put the same into being, they will no longer be worried by the possibilities of a fuel shortage.

The following are the general dimensions of the "Ansaldo San Giorgio I":

Loaded Displacement .....11,280 tons
Deadweight-capacity ..... 8,100 tons
Maximum possible cargo on 7,150 miles voyage, plus 250 tons fuel.....8,000 tons
Maximum weight-cargo yet carried (not including fuel and stores).....7,600 tons
Net cargo carried on latest voyage to N. Y.....470,000 cu. ft
Cubic-capacity of Holds .....450,000 cu. ft.
Length (O.A.) .....393 ft. 11 in.
Length (B.P.) .....378 ft.
Breadth (extreme) .....51 ft. 9 in.
Breadth (moulded) .....51 ft. 6 in.
Depth (moulded) .....30 ft. 2 in.
Draught (moulded) .....24 ft. 6 in.
Type of ship .....Single Deck
Gross Tonnage .....5,580 tons
Net Tonnage .....3,485 tons
Classification—
British Corporation & Registro Navale Italiano.
Power (rated) .....2,200 shaft h.p.
Engine Speed .....100 r.p.m.
Ship's Speed (loaded) .....11 knots



Section of the "Ansaldo San Giorgio I" at the forward end of the engine-room

Propeller Pitch .....3 m. 40 cm.
Daily Fuel-Consumption .....10 to 10½ tons.
Daily Lubr.-Oil Consumption .....1 bbl.
Shaft H.P. hour fuel-consumption .....0.43 lb.
Port Fuel-Consumption (1 boiler).....1½ tons per 12 hr. day.
Cruising-radius with 250 tons fuel 7,150 naut. miles.
Total Fuel-Oil Capacity .....1,500 tons
Number of Engine-room crew .....11 men
Mileage to Date.....29,500 naut. miles. Since May 1st, 1919,
Captain .....Martino Razeto
First-Officer .....S. Omiccoli
Chief-Engineer .....Vincenzo Turturro
Engine-room Crew .....11 men
Total Number of Crew.....45 men

Her first voyage was from Genoa via Palmero to Glasgow and return. Thence she proceeded to Valparaiso and back to Italy. Her third voyage was from Genoa to New York, via Palmero, Naples, Messina, Cartegena, Gibraltar, thence to Philadelphia, an aggregate distance of nearly 30,000 nautical miles. On the latest voyage she brought a tremendous cargo for so small a ship, and her decks were packed with boxes of lemons, as can be seen from the illustration which we ourselves photographed just as she was docking upon arrival.

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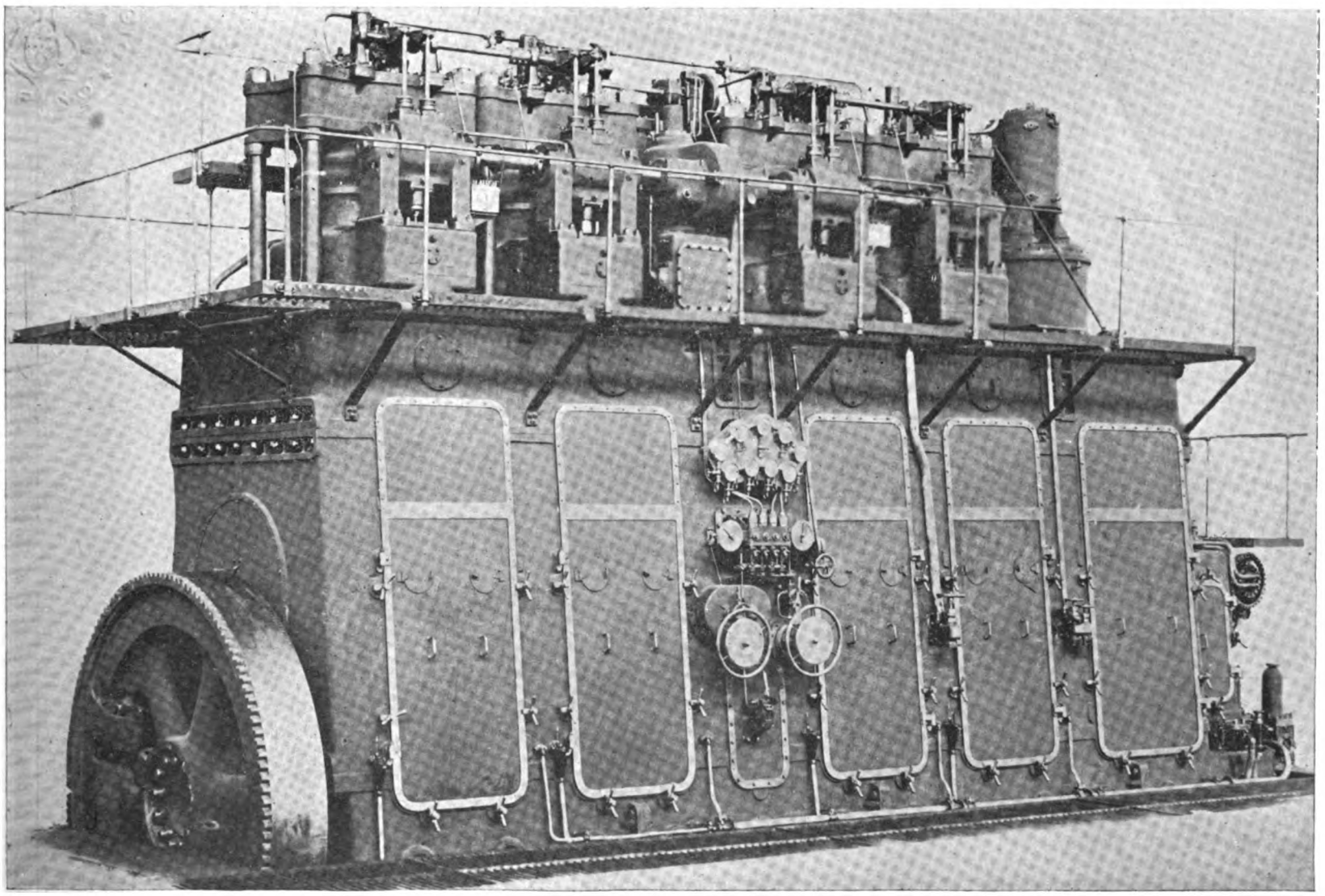
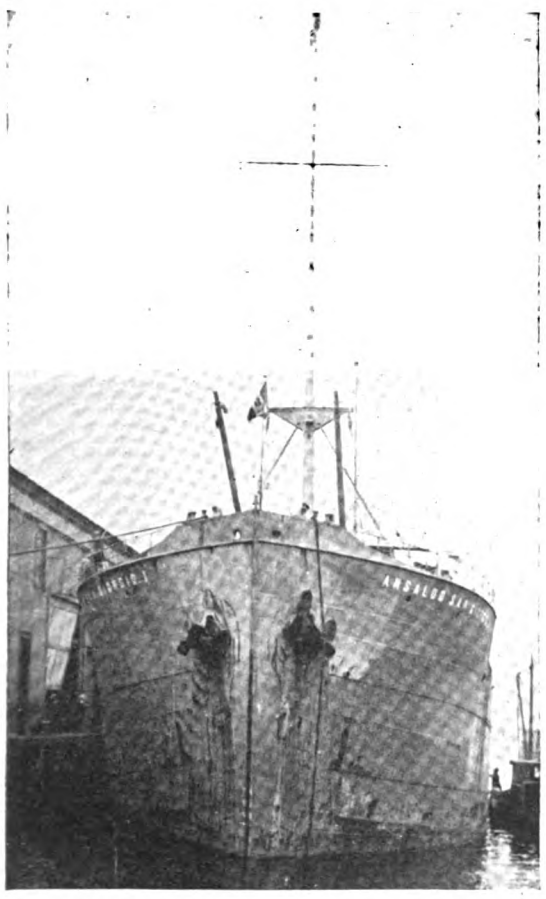


One of the four-cylinder two-cycle type Diesel 1,100 shaft h.p. engines of the Italian motorship "Ansaldo San Giorgio I." Note the very "clean" construction

Altogether her cargo, including deck load, had a measurement of 470,000 cu. ft. and weighed about 7,000 tons exclusive of fuel, water and stores ,and was of a general nature, most of it being fairly light. No steamship of her size, either oil or coal-fired could have found room for such a cargo. In fact, the sister turbine-driven steamship has a cubic-capacity of only 380,000 cubic feet. What makes it more remarkable is that had this motorship been carrying this cargo in the reverse direction she could have taken aboard 1,000 tons of bulk-oil cargo in addition to the above load and her necessary bunker supply, as she was far from being loaded down to her Plimsol mark. Therefore, her true maximum cargo-capacity per *single-voyage* is in the neighborhood of 500,000 cubic feet, without including bunker-oil, etc.



Bow-view with 7,000 tons net-cargo aboard at New York

This will give an idea of her earning powers on a short transatlantic route. When figuring out comparison costs with steamers on short routes, many shipowners have omitted to take this particular extra earning power of motorships, i.e., selling surplus bunker-oil, into consideration.

Among her cargo were a number of stowaways, 24,000 boxes of lemons, 350 barrels of sulphur-oil, bags of Scicilian nuts, about 1,000 cases of olive-oil and vermouth, 100 baskets of edible snails, sacks of garlic, casks of yellow ochre, marble, etc., etc. Her holds have no pillars or stanchions and this feature facilitates handling the cargo. The stowaways were found when the ship reached New York, wedged among the cargo in the tightly-packed hold just under the hatches. They must have had a very uncomfortable voyage.

Looking through the log of this ship we find that her daily runs have varied from 160 nautical-miles in a heavy winter storm to 229 miles in fair weather, but the propeller revolutions are fairly constant. Usually the mileage is from 265 to 270 per day, the low speed mentioned having only occurred once. That she can average over 12 knots on some days speaks remarkably well for the power ouput of her Diesel-engines and for the efficiency of her propellers. For instance here are the

Stern-view with 7,000 tons net-cargo aboard at New York

daily mileage runs on one round voyage, viz.; 270, 299, 219, 219, 160, 219, 239, 219, 216, 209 (¾ day) 256, 264, 267, 264, 273, 263, 265, 262 and 186 (part day). These figures we personally culled from her log. On days when the low

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runs were made the log's records showed very bad weather.

Ansaldo San Giorgio Ltd., with engine-works at Turin and a shipyard at Spezia, is a subsidiary of the great Italian firm of Gio. Ansaldo & Company of Genoa, and they built the complete ship and machinery. For many reasons the propelling-engines of the "Ansaldo San Giorgio I" are of particular interest. They were designed by Giovanni Chiesa of their Turin works, who is an ex-Sulzer man; and, as Ansaldo's are licensees of Sulzer Frérés it is only to be expected that a port-scavenging system is incorporated in this design in preference to valve-in-head scavenging and that here-and-there traces of Sulzer suggestion can be seen incorporated with Signor Chiesa's individuality. Furthermore, Mr. Chiesa is a stronge advocate of the two-stroke cycle, as will be realized by those who read his intellective treatise on the "Two-Cycle Versus Four-Cycle Motor" in MOTORSHIP of February, 1919.

For cylinder power-output in actual marine service the Ansaldo-San Giorgio Ltd. (ex Fiat-San Giorgio), have always been prominent among the leaders, and the newest engines that they lately commenced building—namely the 8,000 shaft h.p. twin-screw sets for six trans-atlantic motor-liners for the same owners—will enable them to maintain that position, as it means 666 shaft h.p. per cylinder. Altogether there are twelve six-cylinder engines for these "express" type vessels. For quite a period their six-cylinder 1,300 to 1,500 shaft h.p. high-speed naval Diesel-engine was the highest-powered submarine engine. This was followed by the pair of slow-speed crosshead-type Diesel-engines that they installed in the Brazilian Government's motorship "Ceara," which together develop 4,400 shaft h.p. (6,400 i.h.p.), from a total of twelve cylinders, 24 8/10 in. bore by 34 4/10 in. stroke at 130 r.p.m., or a cylinder output of approximately 360 shaft h.p.

So, in designing and constructing the engines of the cargo-ship "Ansaldo San Giorgio I," these progressive Italian builders were not without very important experiences upon which to base their present merchantship engine designs. They have consistently adhered to the two-cycle principle, and at no time except in the earliest days of submarine work have they turned to the four-cycle system. Undoubtedly they have produced an excellent example of marine engineering in these motors, the machine work being very fine.

Although the engines of this ship are rated at 1,100 shaft h.p. one of them developed as much as 1,800 shaft h.p. on overload tests in the works for a short period. This means a maximum of 450 shaft h.p. per cylinder, as they have but four-cylinders, whereas both the "Ceara's" motors have six. In fact, very severe tests were given to the engines of "Ansaldo San Giorgio" including the following 36 hour overload run:

Overload Trial on 1,100 B.H.P. Ansaldo-San Giorgio Diesel Engine.

Overload	Duration of trial	Revs. P. M.	B.H.P.	Fuel-oil Consumption per B.H.P. hour	Lubricating Oil-consumption per B.H.P. hour
47%	1 hour	127.7	1,622.5	0.445 lb.	
30%	30 hours	116	1,433.0	0.440 lb.	0.006 lb.
12%	5 hours	104.7	1,232.5	0.425 lb.	

Regarding flexibility, we will mention that they were run as low as 35 r.p.m. under the brake, at which speed but 41 shaft h.p. was produced. Better ship's manoeuvring qualities could hardly be required. When we first went aboard in New York she was in the act of docking at Pier 25 North River with the aid of but one tug, and it was pleasing to note the gentle manner in which she came alongside the wharf, the engines responding to the signals from the bridge far more quickly than steam machinery. These remarks also apply to when we docked at Philadelphia. One of the first statements of Captain M. Razeto after we boarded the vessel was a commendation of the ship's maneuvring ability and that the New York pilot was greatly pleased to find that from "full-ahead" to "full-astern" only took eight seconds—almost an unknown quality with a steam-driven ship.

Under the reigning oil-shortage conditions the matter of fuel-quality and fuel-supply for motorships is one that needs careful thought, and the experiences of the "Ansaldo San Giorgio I" are worthy of relating. At first she used a heavy Roumanian crude-oil, but this was found to be very dirty, so a change was made to Mexican crude of 22 to 18 deg. Baumé and of 0.92 to 0.95 specific-gravity, with which her Diesel-engines have operated excellently and with complete reliability.

While in New York on this trip she was unable to obtain similar fuel. Quotations on solar-oil were given by two prominent oil companies—one for $48.00 per ton for oil having not over ¼% sulphur, and the other $43.50 per ton for oil with not over ½% sulphur. This is a higher price than the ship has to pay for heavier Roumanian oil in Italy. For their

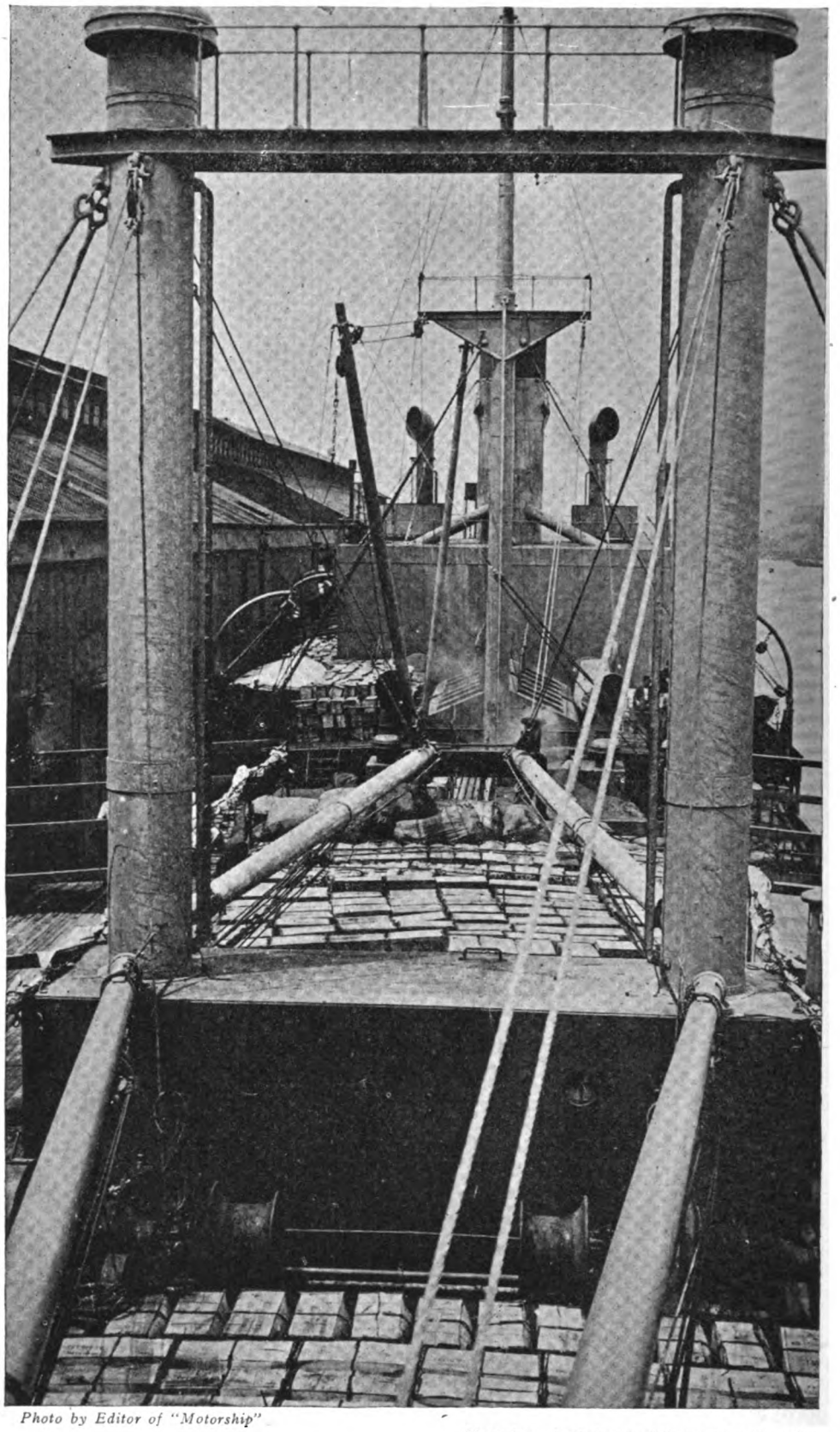

Photo by Editor of "Motorship"

Showing deck-load of lemons when the "Ansaldo San Giorgio I" arrived at New York. The total cargo amounted to 370,000 cubic feet, or 12 to 15 per cent more than a steamship of similar dimensions and speed could carry, as proved by her sister geared-turbine driven freighter

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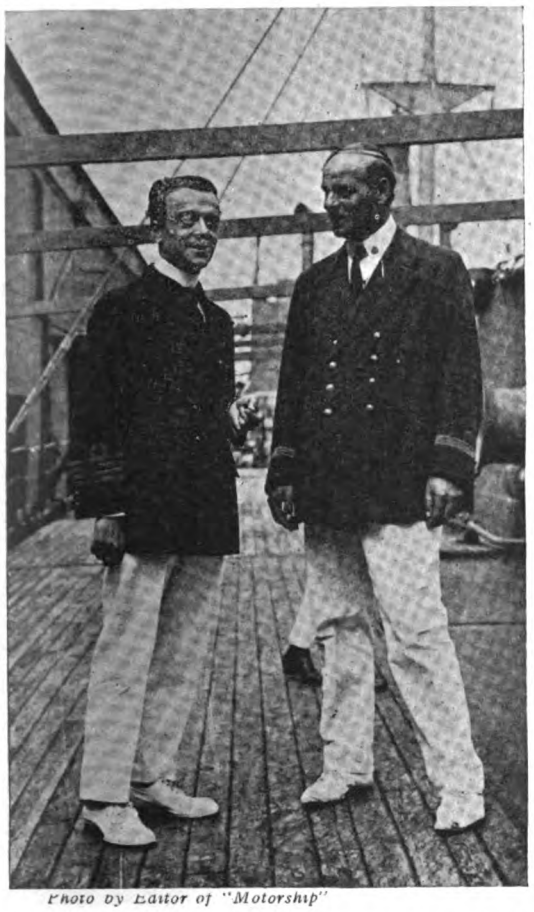


Photo by Editor of "Motorship"

The Captain (on left) and his Chief-officer of the motorship "Ansaldo San Giorgio I"

previous load of Mexican fuel they paid $12.50 per ton at Panama.

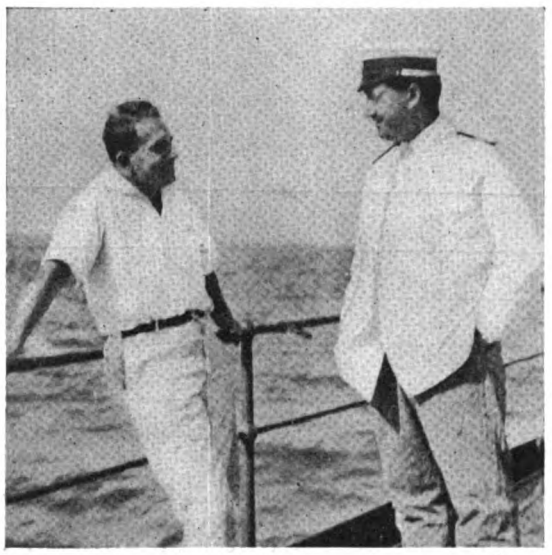
For a one-way voyage to Italy she only consumes about 180 tons of fuel, so as the cost of American oil is now so high she need have only taken aboard 200 tons, and re-fueled with cheaper Roumanian oil in Italy. However, there is a ready market for American solar oil in Southern Europe, so 900 tons was bunkered, and of this we expect that 500 to 600 tons will be sold as oil-cargo in Italy at a higher price, leaving sufficient to cruise back to America or to the Panama Canal. She could have taken 1,500 tons of this oil, had it been available and had not her general cargo been of a heavy nature, which means about 1,200 tons of the same would have represented oil-cargo, or a big earning power not possessed by a steamship.

In the ordinary way $6.25 per barrel is a high price to pay for bunker-oil, but as her consumption is so low the total fuel-bill to Genoa will not exceed $7,850.00. Possibly she will sell the balance of the oil at a figure that will produce sufficient profit to pay for the 180 tons consumed. In other words fuel may cost the "Ansaldo San Giorgio I" exactly nothing. In the face of this one can imagine the big fuel-bill on a similar voyage of the American geared-turbine steamships that recently were obliged to bunker the same grade of oil for burning under their boilers; a scandalous waste that should not be allowed, instead of encouraged by our Government. With 250 metric-tons of oil aboard the "Ansaldo San Giorgio I" has a radius of 7,150 nautical miles.

Because of present oil shortage conditions American oil companies may possibly feel relieved that motorships can do what the "Ansaldo San Giorgio I" did, as they seem to have difficulty in meeting the current demand; but it foretells a loss of future trade, because foreign motorships with their very large cruising-radius will not be dependent upon the American oil supply, or upon our overseas tankship services, as they will bunker where oil is the cheapest. The same applies to American merchant motorships engaged in overseas transportation when a large number are in service a few years hence.

But, the owners of the "Ansaldo Giorgio I," and other big European motorship owners, including the East Asiatic Company and the Rederiaktiebolaget Transatlantic, have gone a step further in order to also render independent the fuel supply for their *steam*ships as well as for their motor-vessels. They have built or are building large Diesel-propelled tankers, which can economically carry oil-cargo with a minimum of self-bunker oil. Thus these tankers can obtain their cargoes from any port of the world where the terms are the most reasonable. To save time the Societa Nazionale di Navigazione have changed the plans of their motor-freighter "Ansaldo San Giorgio IX" to carry bulk-oil. This tanker will deliver the oil to a large storage depot that Ansaldo's are now erecting at Genoa. We have commented on this oil situation elsewhere in this issue.

Generally speaking the bulk-oil motor tanker "Ansaldo San Giorgio IX" corresponds to the standard 8,100 tons freighters, although, of course, the construction differs, and there is



The Chief-Engineer relates some of his Diesel engine experience to us—and seems to be quite happy about them!

a variation between the proportions of net cargo-carrying capacity and loaded-displacement, and the economy of operation. The plans which we publish show the design of the hull allows of a change from twin-screws to a single-screw vessel if desired. The yard number of this vessel is 197. Her dimensions are as follows:

Photo by Editor of "Motorship"

The Captain asks his Chief-engineer if all is well down below. The answer is "Aye, aye, sir!"—in Italian language

Deadweight Capacity	8,100 tons
Net Capacity of Tanks	6,920 tons crude oil or 6,305 tons petroleum or 5,535 tons gasoline.
Capacity of Summer Tanks	930 tons crude oil or 747 tons gasoline.
Net Capacity of General Cargo Hold	72,500 cu. ft.
Bunker Capacity	570 tons
Ballast & Deep Tanks	638 tons
Lubr. Oil Tank	40 tons
Fresh Water Tanks	74 tons
Length	380 ft. 8 in.
Breadth	51 ft. 10 in.
Depth	30 ft. 4 in.
Speed (loaded)	11 knots
Power	2,200 shaft h.p.
Class	British & Italian Corp. 100 A.I.

Construction of the hull is on the transverse system ,and a double bottom is provided over the whole length, the section between frames 144 and 167 being used for the bunker-oil. Altogether there are 14 water-tight bulk-heads

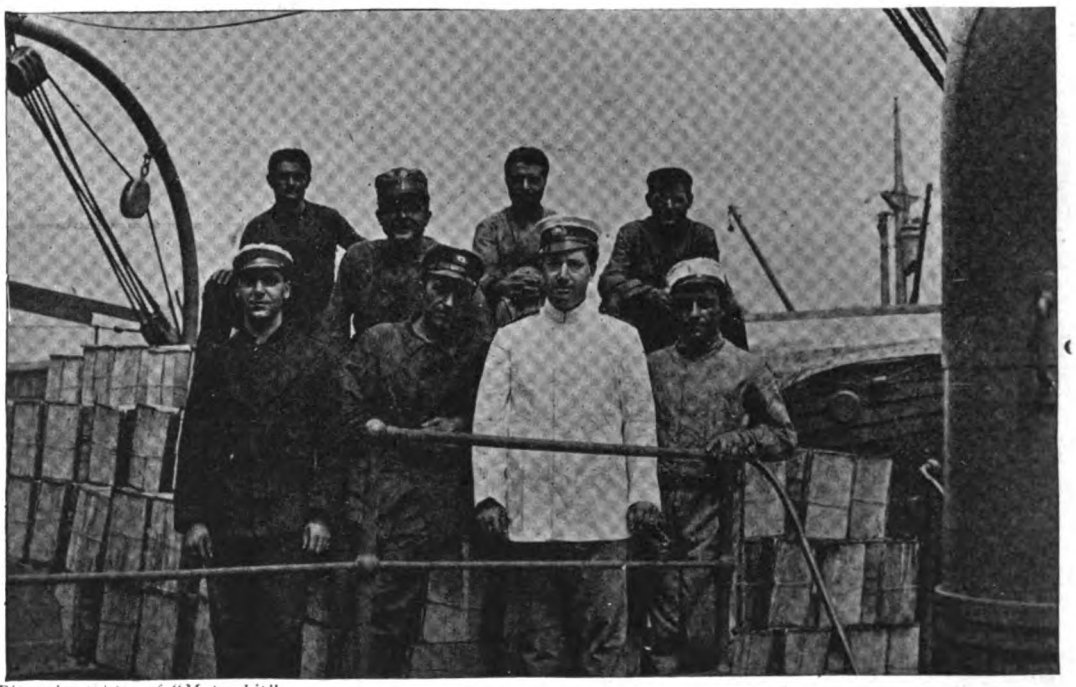


Photo by Editor of "Motorship"

Engine-room crew of the m.s. "Ansaldo San Giorgio I"

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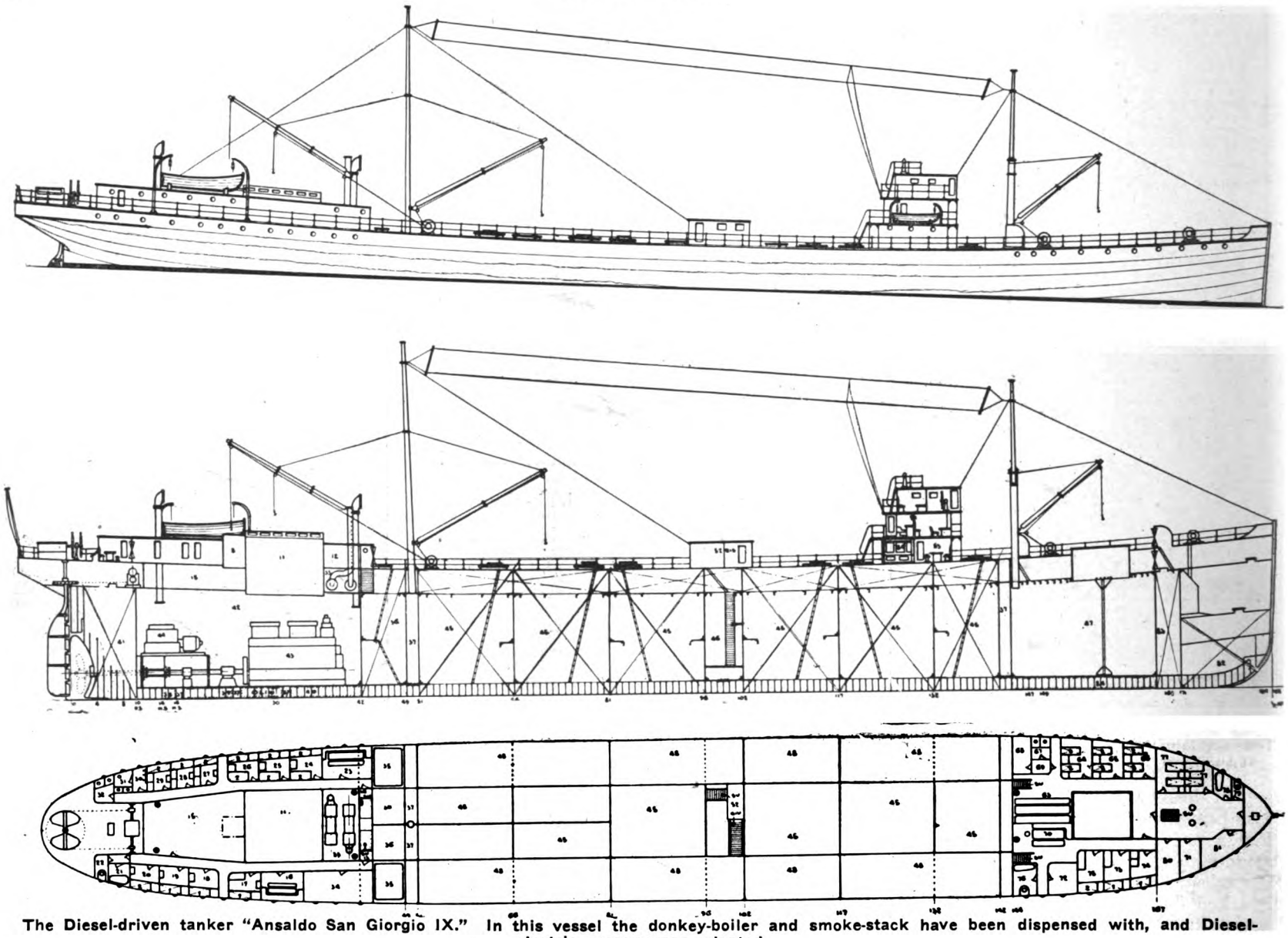
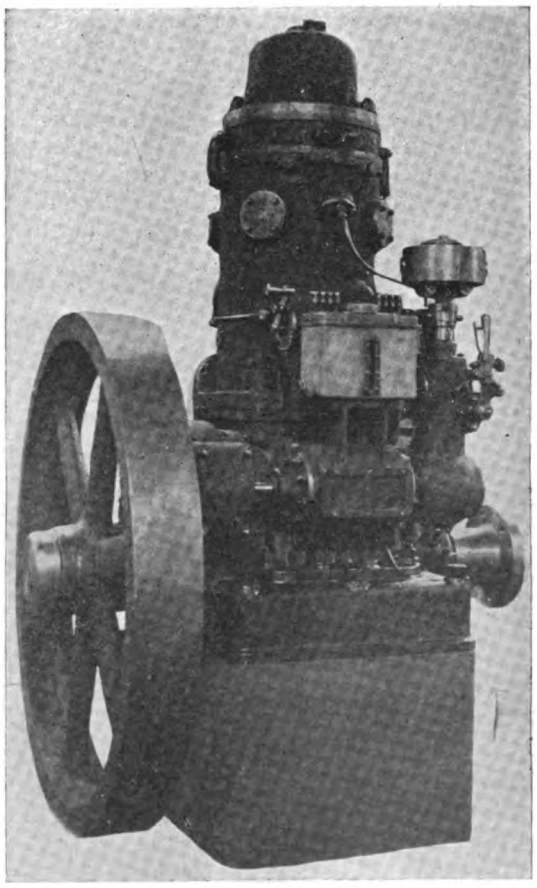


The Diesel-driven tanker "Ansaldo San Giorgio IX." In this vessel the donkey-boiler and smoke-stack have been dispensed with, and Diesel-electric cargo-pumps adopted

forming 15 compartments. The hull is built of open-hearth steel with two decks, and the spaces between frames are short to increase the stiffness to a greater extent than the longitudinal system.



One of the two 20 b.h.p. "Ansaldo San Giorgio" surface-ignition oil-engines, which drive emergency air-compressors in the engine-room

There are two masts and two vertical derrick-beams, and five cargo-booms operated by 3 winches for the cargo hold forward. Differing from other motorships built by this company, there is no smokestack, the cargo-booms being utilized to carry away the exhaust gases from the main and auxiliary Diesel--engines, which are situated aft.

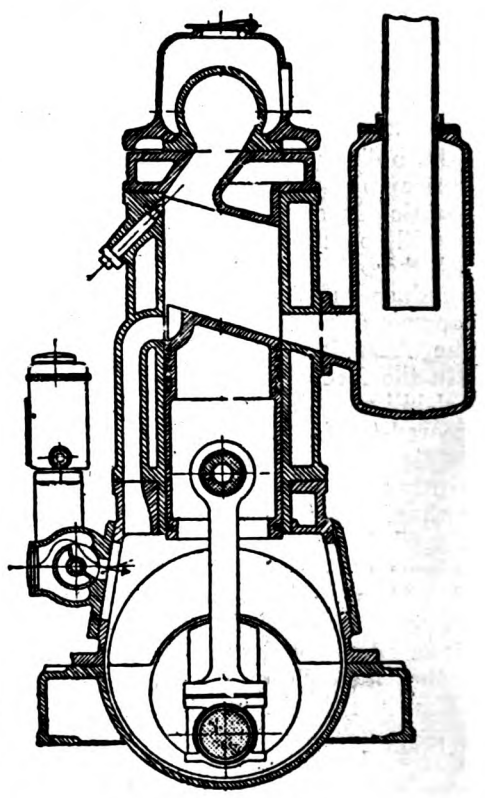
The Captain's and deck-officers' quarters are located in the bridge-house and the engineers are quartered in the aft deck-house. The deck crew has its quarters in forecastle on the main-deck and the engine-crew on the same deck at the stern.

In addition to the twin Ansaldo San Giorgio Diesel propelling engines there are installed in the engine-room two Diesel-driven electric generating sets for the engine-room as well as the deck auxiliaries. They furnish power for the following:

Two electric-driven manoeuvring compressors.
Electric-driven water and oil circulating pumps.
Electric-driven Bilge, general service.
Ballast-pumps, fresh-water pumps and fuel transfer pumps.
Electric lighting system all over the ship.
Three electric-driven winches and two windlasses.
Steering gear is driven by compressed air.

The cargo pump-room is located as stated before between the 3rd and 4th tank. Electric-driven pumps of the larger capacity are installed for discharging the cargo.

For our oil companies to build tankships that consume 15% to 25% of their d.w.c. cargoes as fuel is erroneous on the face of it, and the suggestion of non-reliable Diesel-propelling engines is really an evasion caused by doubt or by previous unfortunate experiences—not a logical reason. Hence why so many *steam*-driven tankers are now under construction in the U. S. A. instead of motor-tankers. Most of the American oil companies are dubious about engine-trouble if they build motor tank-



Section of "Ansaldo San Giorgio" surface-ignition oil-engine. Note special design of water-cooled head. No silencers are fitted to the pair in the ship, so the exhaust is very noisy

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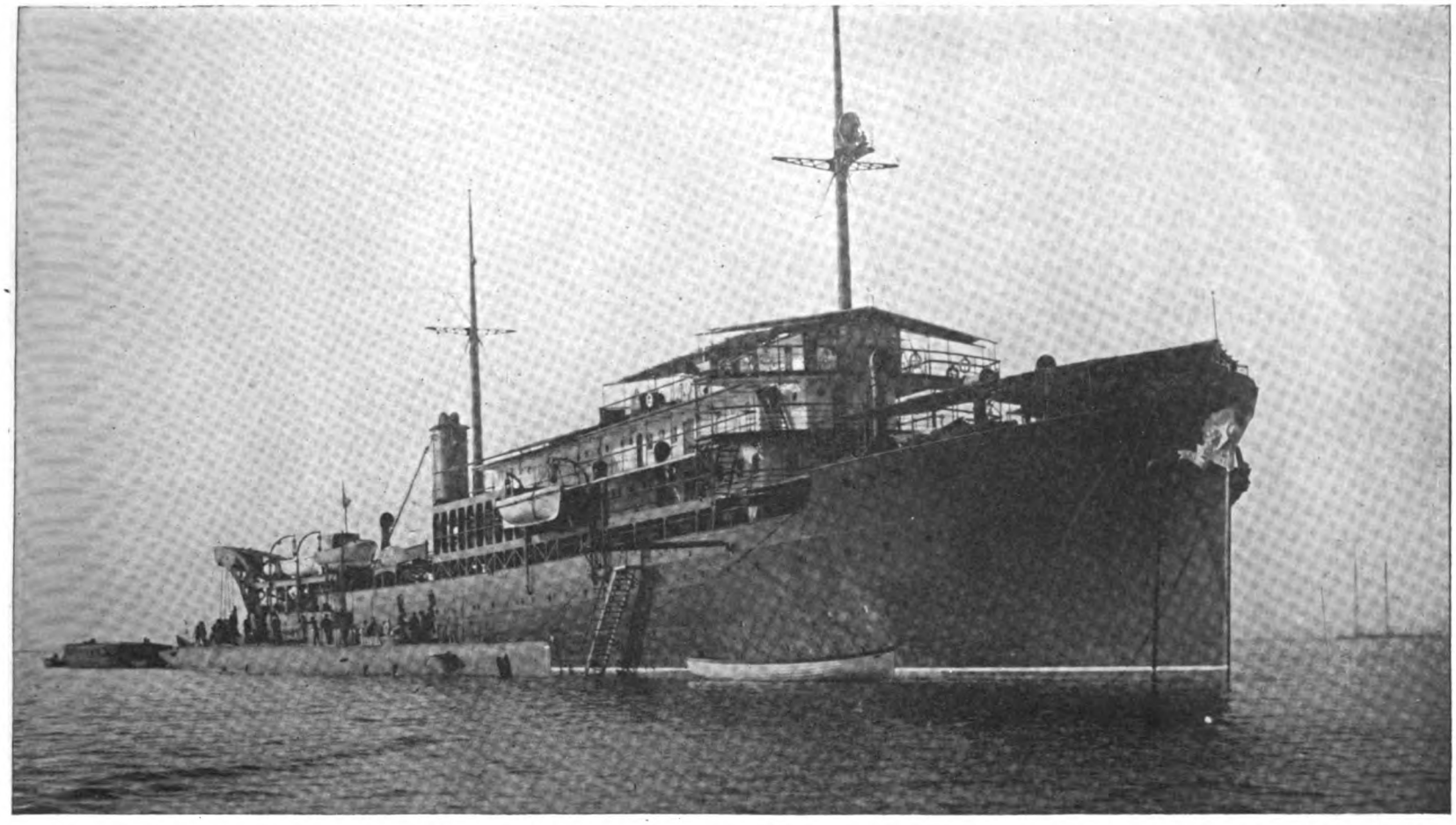
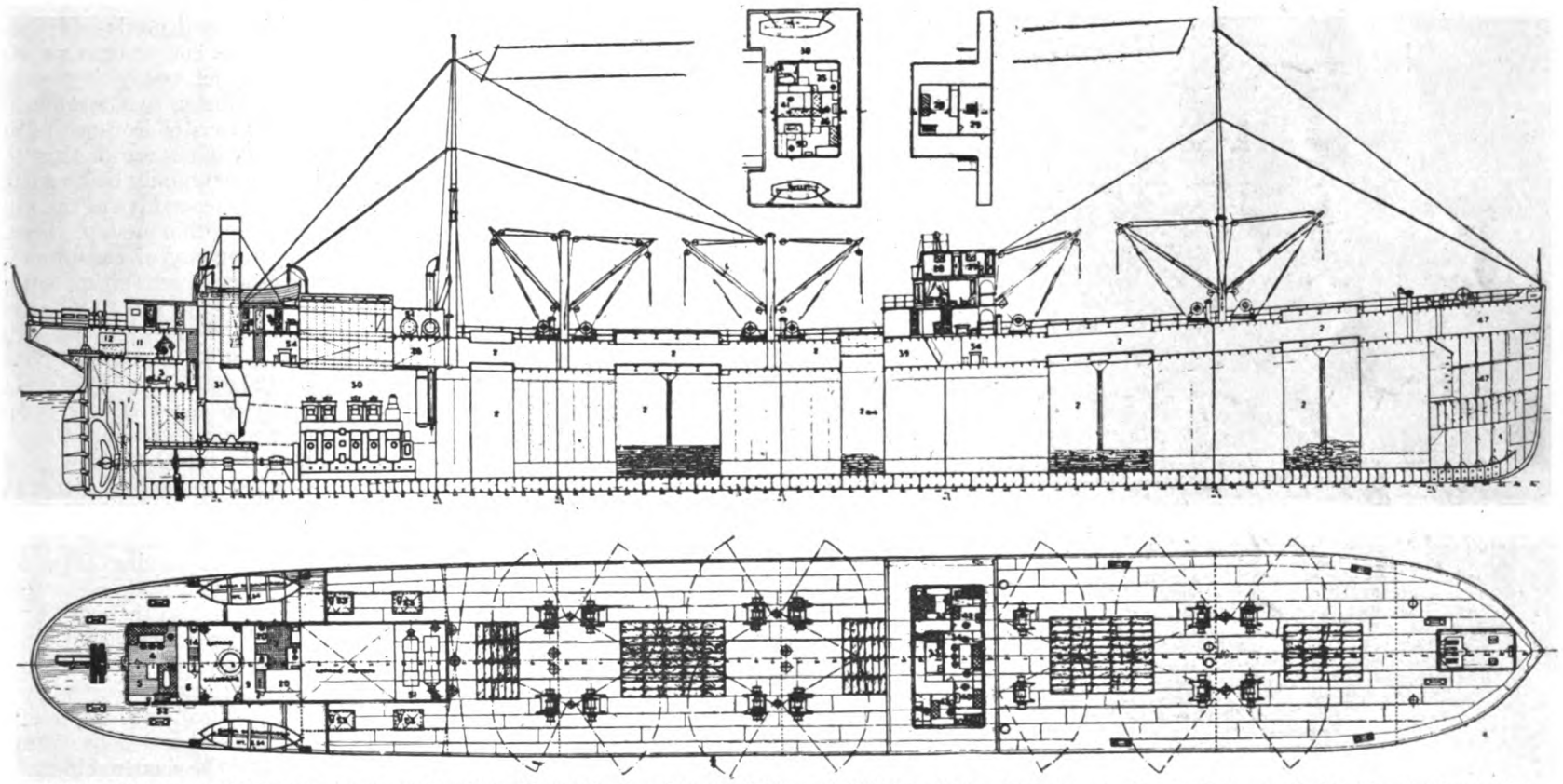


The two 2,500 shaft h.p. Diesel engines of this Brazilian naval motorship "Ceara" are prototypes of engines in the "Ansaldo San Giorgio I." The recent accident to the submarine "S5" shows that the U. S. Navy needs a similar Diesel-driven motorship, only twice her size, for raising sunken submarines

ers, and consequently are chary of taking the "risk" of ordering large motorships from American shipbuilders. Nor are they encouraged to go ahead at present by several of our leading shipbuilders who are frank in saying that just at present they cannot guarantee or recommend such vessels; but, that when they have built and tried-out high-powered Diesel engines themselves they will not hesitate in urging the oil companies to construct motorships; but that up to now they have been too busy to develop this class of power. However, such a policy will never maintain an American merchant marine. A man must never be afraid of progress in his own business.

Regarding the hull of the "Ansaldo San Giorgio I", it is divided into eight water-tight transverse compartments, giving complete assurance of buoyancy in case of accident to any part of the hull. The foremost and aftermost of these compartments (trimming tanks) can hold respectively 4,273 and 4,450 cubic-feet of water-ballast. As to her capacity for carrying oil it will be noted that there is a cellular double-bottom throughout, divided into six compartments, the after three of which are used for fuel-oil for the Diesel engines and donkey-boilers; while in the others, 31,783 cubic feet of mineral-oil cargo can be carried. The total oil-capacity, including 350 tons in the wing tanks, is 1,500 tons and 25 tons of lubricating oil. Every compartment of the double-bottom is connected to the pumps.

Before further discussion, perhaps we had better mention that each of the four working-cylinders per engine have a bore of 630 mm. (24.803 in.), by a piston-stroke of 900 mm. (35.433 in.), and the rated output of 1,100 shaft h.p. is developed at 100 r.p.m. At this



Plans of the new 8,100 tons d.w.c. motorships "Ansaldo San Giorgio VII" and "VIII." Note that the smoke-stack is used for the donkey-boiler only, and that the main Diesel engines exhaust up the after mast.

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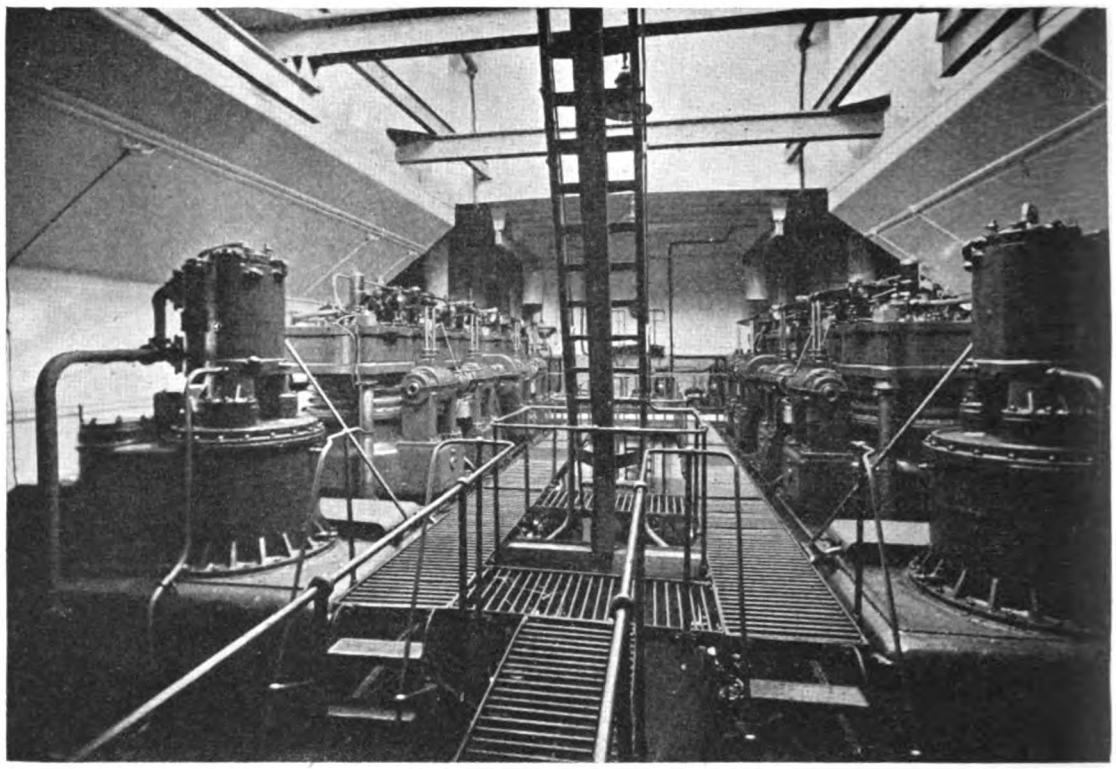
speed and power the mean effective-pressure is quite low, namely 64 lbs. per square-inch, and the piston-speed is 590 ft. per minute. The cylinder compression-pressure is 450 lbs. per sq. inch, and the consumption 0.43 lb. per shaft h.p. hour.

Considering that on this latest transatlantic voyage the engines averaged 95 revolution per minute, compared with 90 r.p.m. on her maiden voyage, and that from New York to Philadelphia they averaged 106 r.p.m. it means that they are standing-up well to their designed power, evidently indicating that it is not an unwise plan to adopt a moderate rating and operate the engine regularly at that load—particularly with two-cycle machine—in preference to adopting a maximum continuous power rating and then run at 90% rated load under service conditions. Because, no engine should be run steadily at full-load for month after month. As a matter of fact many American motorships have been under-powered and their owners have endeavored to have the engines operated at overload continuously with disastrous results, for which themselves—not the engines, are to blame,

We have to remember that with a steamship the shaft h.p. is constantly varying (especially with a coal-burner), whereas the power of a Diesel-engine is practically constant hour-after-hour and day-following-day in both calm and heavy seas, so that its work is more severe. However, without entering into a discussion of the respective merits of the two and four-cycle methods of combustion, it is generally agreed among marine-engineers that the latter type of engines will operate consistently at a higher mean-effective pressure than the two-cycle, and that it actually does so in merchant-marine service, so it is customary to rate two-cycle engines fairly low. Captain Razeto said that often they would keep alongside a steamship of the same speed for about four hours, then the steamer's watch would change, down would go the pressure and her speed and the motorship would forge ahead.

What is very noticeable in the "Ansaldo San Giorgio I" upon going below, is the small amount of space required by her Diesel machinery. As the engines are installed in the after part of the ship the actual length of the



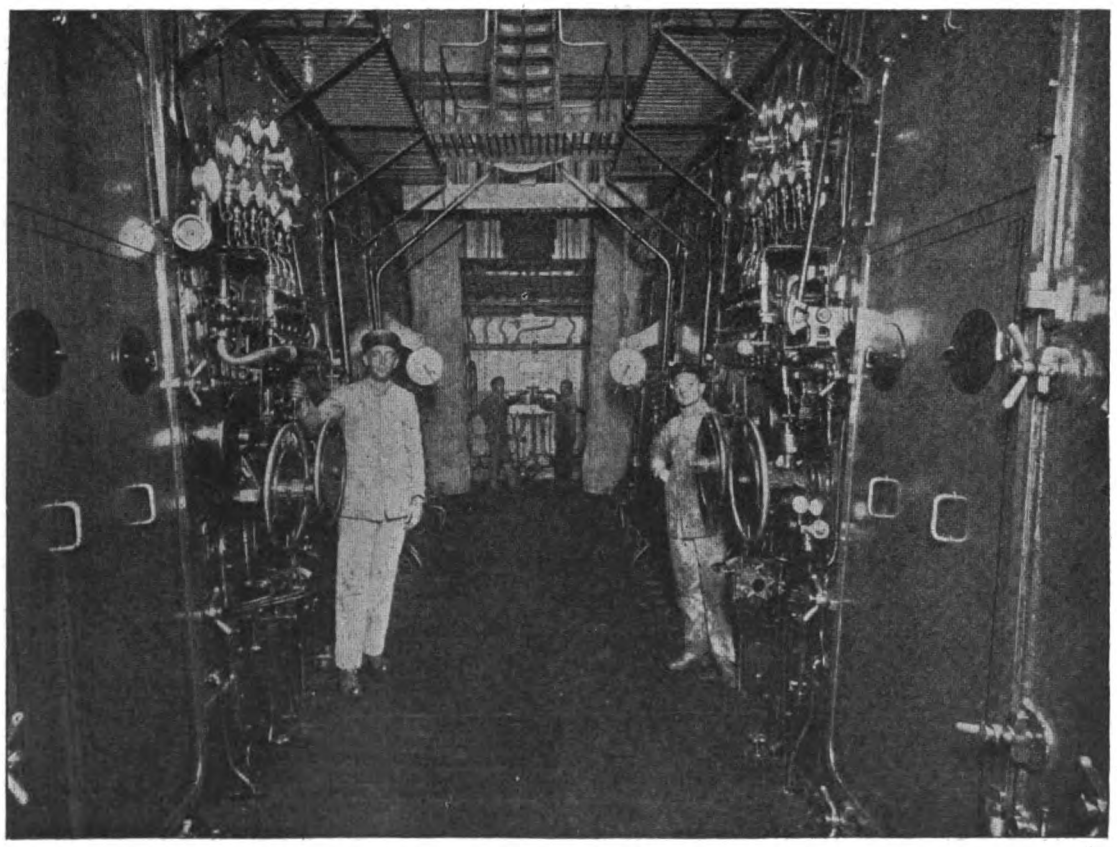
View on upper platform of engine-room of the m.s. "Ansaldo San Giorgio I"

engine-room is greater than it would be if the machinery was amidships, as the fining away of hull aft leaves some space that is not used. But, it is doubtful if any cargo-space would be gained by moving the engine-room further forward, because of the two shaft-tunnels that would then encroach upon the cubic-capacity of the holds and because the machinery would then occupy a section in the widest part of the hull, namely—amidships.

To compare the space occupied by oil-fired geared-turbine machinery we also reproduce drawings of the steamship "Ansaldo I" built by the same company at another of their shipyards for the same owners. The total output of the turbine-plant is the same as the power of the Diesel engines, namely 2,200 shaft h.p. It will be noticed that together with thrust-blocks the engine-room of the "Ansaldo San Giorgio I" occupies only 22 frames; whereas the turbine machinery takes up 31 frames without the thrust-block, and it has been necessary to install some of the pumps in a compartment above the deep-tank just forward of the engine-room of the steamship. So the minimum space required by the steam plant is really about 35 frames. Reference to the drawings show a considerable cargo-capacity gain to the motorship, especially as on the longest voyages (round the world), the latter needs no deep-tank for fuel, even if she does not bunker en route, provided her fuel-tanks are full at the start. We understand that the average speed of the motorship has been better than that of the steamer.

We were told by the officers of the motorship "Ansaldo San Giorgio I" that her holds can actually carry from 900 to 1,000 tons more cargo than the sister steamship, which is of exactly the same dimensions but which on all long voyages is obliged to carry fuel in her deep-tank. Whereas the Diesel-vessel always uses her deep-tank for cargo, except perhaps when running light and needs additional ballast-water. To give a comprehensive idea of her carrying-capacity let us say that on her maiden voyage from Genoa to Glasgow via Palmero she had 7,600 tons of iron-ore in addition to fuel. On the first stage of this trip she averaged 11½ knots and only bad weather reduced her speed on the second leg of the voyage. The two legs were both non-stop. Therefore, aside from the economy of consumption and operation we conservatively estimate that with today's reduced freight rates at current freight rates the motorship must have an extra earning-power of at least $30,000.00 per round voyage; or say—$120,000.00 to $150,000.00 per annum according to the voyage's length and number made per year. About 50% of this amount additional could be added to the total for the fuel saved and other economies effected, or a total gain of about $225,000.00 per annum. It should be borne in mind that the engines of this motorship having only four cylinders are shorter and lighter than most six-cylinder four-cycle engines, so the weight and cubic space gained is larger than usual.

As both the steamer and the motorship are of 8,100 tons d.w.c. it once again illustrates the error of using the term "deadweight-capacity" to denote the size of a vessel under the changed conditions of today, and the sooner shipowners standardize the term "weight" (or cubic) cargo-capacity," or as an alternative "net car-



Engine-room of the "Ansaldo San Giorgio I" showing the simple control mechanism

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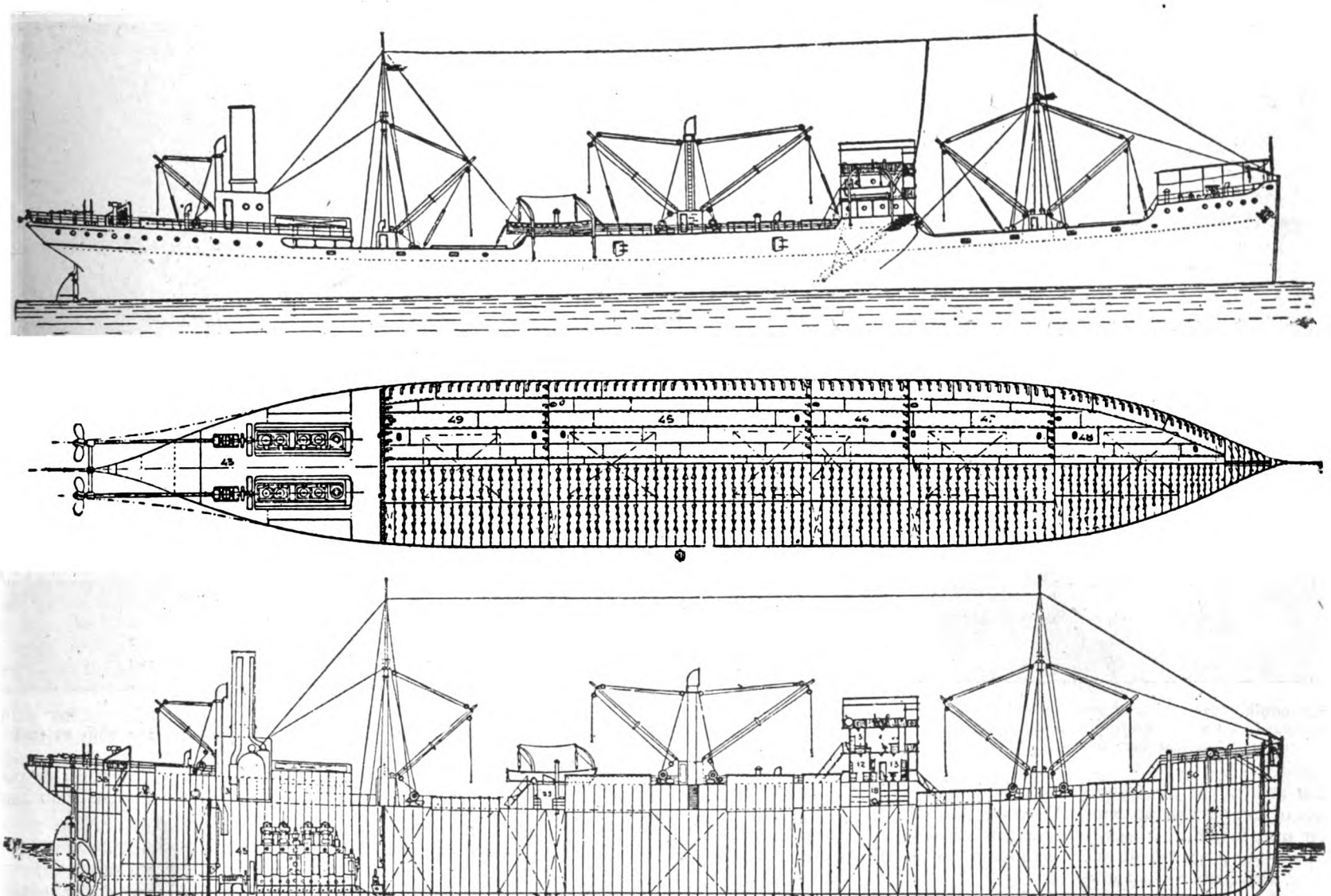
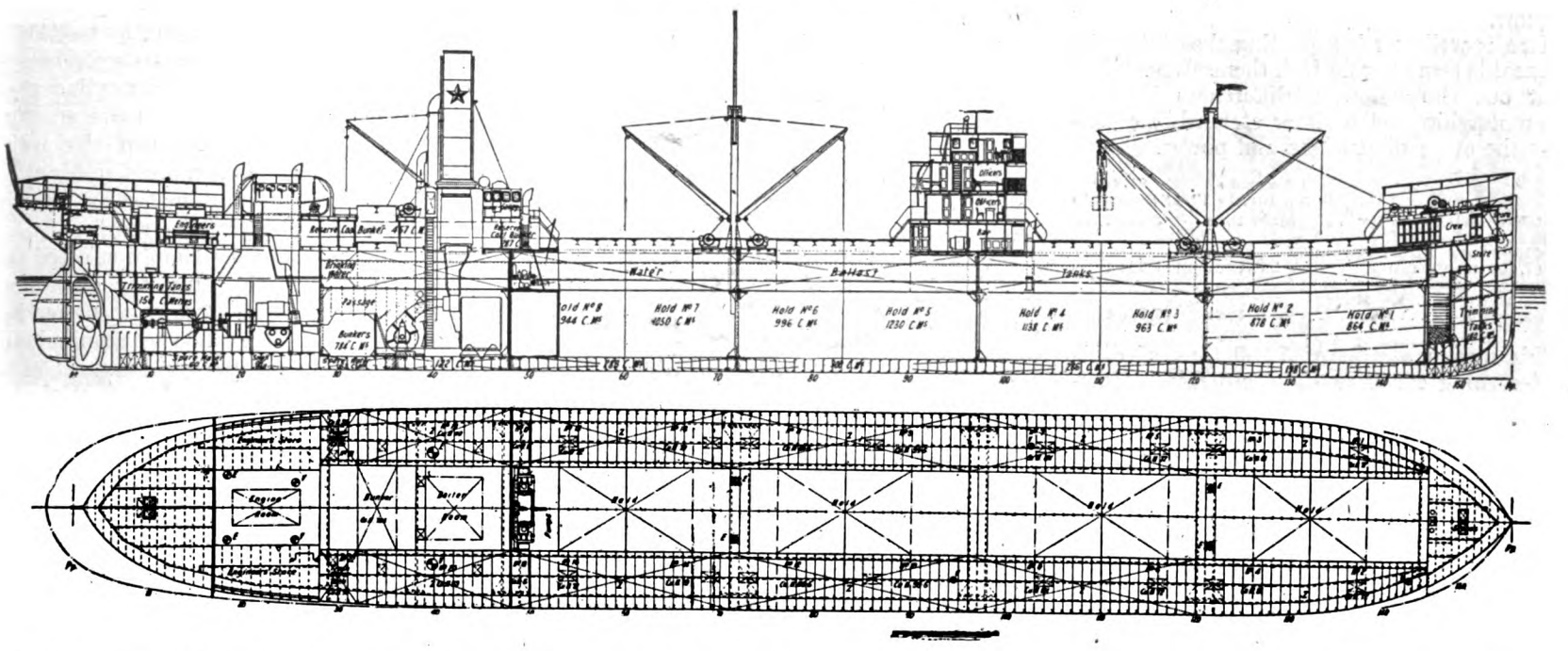
A COMPARISON BETWEEN TWO SHIPS OF EQUAL DIMENSIONS

DIESEL POWER



General arrangement plans of the Diesel motorship "Ansaldo San Giorgio I." This drawing is made to exactly the same scale as the drawing of the geared-turbine steam-driven ship "Ansaldo I," reproduced below. Thus accurate comparisons of their respective power machinery and cargo spaces can be made

GEAR-TURBINED STEAM POWER



The geared-turbine driven steamship "Ansaldo I." Comparing her with the sister Diesel motorship "Ansaldo San Giorgio I," note that the machinery (including deep-tank, day-service bunkers, pumps and thrust-block) occupies 38 frame spaces compared with 22 spaces for the complete engine-room of the Diesel boat. The space over frames 48-53 is the deep-tank with the pump-room above. The motorship's deep-tank is always used for cargo when fully laden

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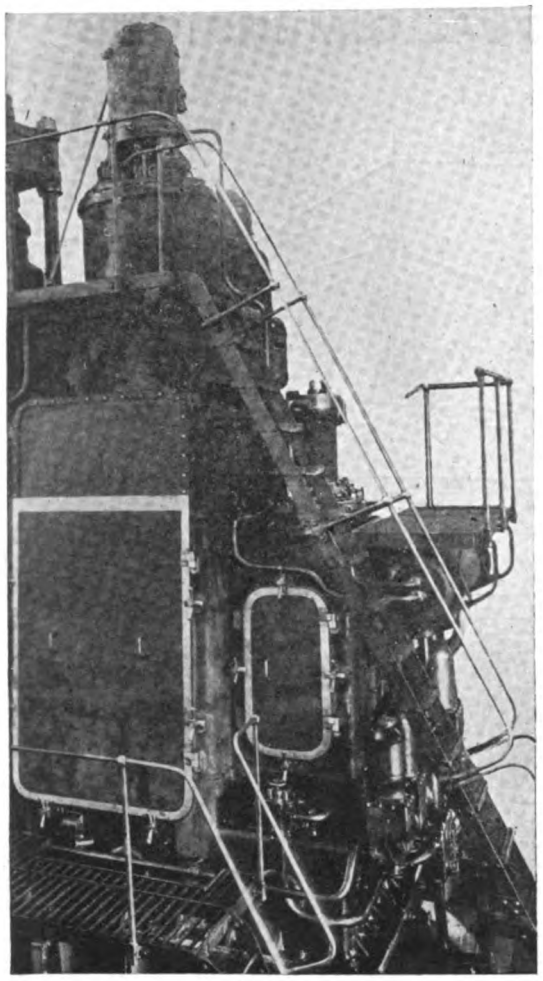


Scavenging-pump, air-compressor and cooling-pumps of one of the main engines of the "Ansaldo San Giorgio I"

rying-capacity," the sooner will the advantages of motorships be generally recognized to their own benefit. Meanwhile we are obliged to use the term "deadweight-capacity" ourselves, although we object to it.

The firm of Ansaldo San Giorgio Ltd., who have built over 40 steamships up to 20,000 tons each are quite emphatic in their statements that the Diesel-driven motorship is vastly superior to the uneconomical steam-propelled vessel—in cargo-capacity, operation, economy, and reliability. As the Societa Nazionale di Navigazione is also a subsidiary of Gio. Ansaldo and operates both steamers and Diesel ships, they should be in a position to know.

Here is well worth repeating the statement of Ansaldo San Giorgio Ltd. themselves. They point out the following differences between this motorship and a sister steamship of exactly the same dimensions and power.

	"Ansaldo San Giorgio I"	Sister Steamship
Dead-Weight Capacity ...	8,100 tons	8,100 tons
Amount fuel required for 650 hours at 11 knots (7,150 naut. miles) ...	250 tons	1,360 tons
Net cargo carried in addition to water, stores and fuel	8,000 tons	6,890 tons

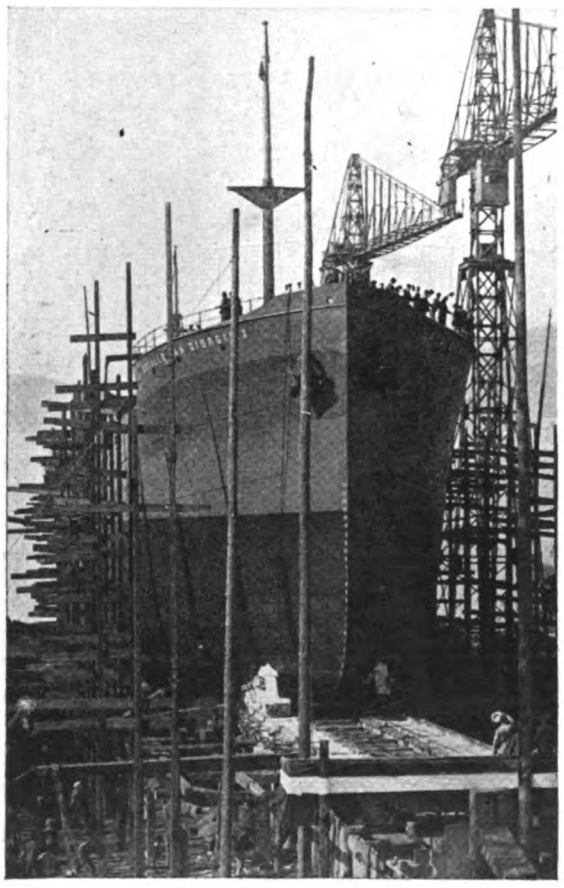
This means a gain of 1,100 tons of dividend-earning cargo to the motorship. However, the steamer in question is coal-burning, so with an oil-fired steam vessel the consumption would be about 20% less or say 1,088 tons, leaving a carry-capacity gain to the motorship of 838 tons. But, they have not taken into consideration the boiler-water and saving in machinery weight, making at least another 150 tons to the favor of the Diesel vessel.

Furthermore, as builders of both types of ships they assert that the difference between the first-cost of the two ships is certainly no more than one-hundred thousand (100,000) lira. This is very interesting indeed.

We have omitted to mention that the length of the "Ansaldo San Giorgio I" Diesel engine is 9,670 mm. long by 5,490 mm. high above shaft center and 3,000 mm. wide across the bed-plate. The latter conforms more to our own ideas on the width of engines at the base in proportion to the height, as we consider some engines in the past have shown a tendency to be insufficiently wide at the bedplates for their height, with consequent slight swaying or vibration. This does not mean that we are correct, as we do not claim to be a practical engine-designer, but is merely an impression resulting from studies of the different designs, conversations with ship's engineers, and from operations of engines in service.

When entering the engine-room of the "Ansaldo San Giorgio I," the most noticeable feature is the design of the cylinder heads and the method of holding them down. They are massive steel box-form castings held directly down to the bedplate by vertical steel tie-rods so that the cylinders are relieved of all end-stresses. Two-cycle engines of the port-scavenging type give the very great advantage of simplicity in the cover, and here there are only the fuel-injection valve, the air-starting valve, and the relief-valve, the two former being operated by rockers from a cam-shaft running along the upper part of the cylinders.

This question brings into mind the difference on this point that exists among builders of two-cycle marine Diesel engines. Some designers, among whom are Doxfords, Junkers, and Cammell Laird, believe in entirely dispensing with the cylinder-head together with its valve-orifices. Others, such as Sulzers, Atlas Diesels Motorer, and Ansaldos favor limiting the valves opening to a central one for the injection-valve and so obtaining a more uniform casting. Lastly companies like the M. A. N. (Nürnburg), Carels, Nordberg, White and Bethlehem maintain that half-a-dozen well-designed orifices in the head are far safer than one poorly-designed orifice and so have from two to four scavenging-valves in the cylinder head in addition to the fuel-injection valve. It is the latter type of engine which Chas. W. Schwab of the Bethlehem Steel Company recently claimed was the only



Bow view on February 20, 1919, just prior to her launch

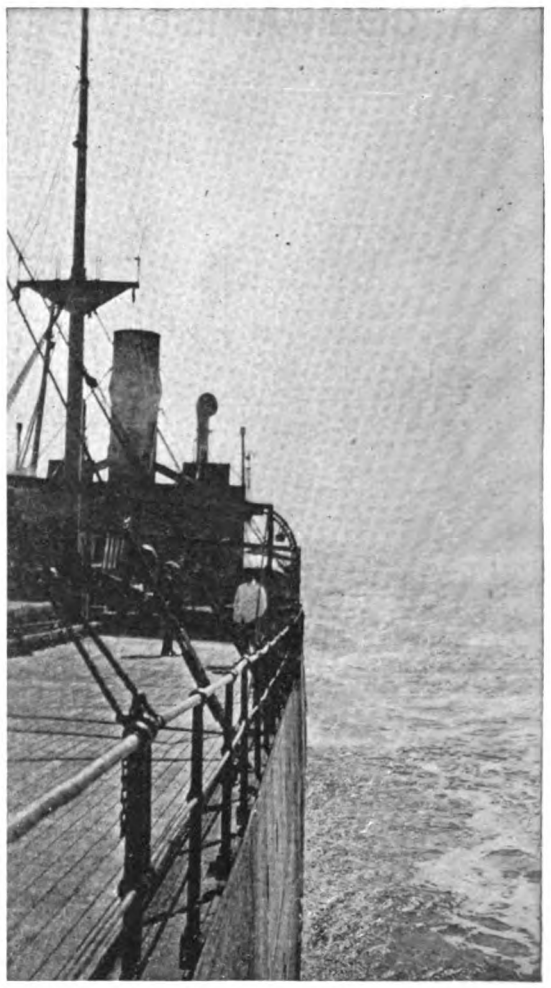


Photo by Editor of "Motorship"

Note the clear exhaust with the ship at full speed

successful two-cycle marine internal-combustion oil-engine.

By means of eccentrics the cam-shaft just referred to also drives the scavenging-air control-valves, and is shifted round for astern running, in the now generally recognized manner, by sliding the worm-gear on the vertical driving-shaft. This sliding of the gear is effected by a little air-driven servo-motor on the shaft of the left-hand one of the two hand-wheels on the starting platform. The right-hand wheel is driven by another servo-motor, which rotates a shaft at the back of the engines, which by means of a cam-path disc gives four different conditions—(1) all four cylinders on air, (2) two cylinders on air and two on oil, (3) all four cylinders on oil, and (4) stop. On this shaft are arranged cams which automatically open the relief-valves and so release all compression for starting-up, another cam automatically opening the main air-starting valve as required.

Reversing is thus very simply effected, the first operation being to turn the one servo-motor to put the cam-shaft in the ahead or the astern position, and then by manipulating the other wheel to put the control-shaft in the first position, then in the second, and then in the third, when the engine goes away on oil, the control of the speed being further effected by the little handle above the cam-shaft wheel which regulates the oil supply. The cam-shaft driving-gear is inside the big box casting forming the framing, so that a very simple-looking engine results.

Each main cylinder is suspended by studs from a heavily ribbed cast-steel frame of square form in plan, which is supported from the entablature by four turned-steel columns. These are distinct from the steel tie-rods holding down the cylinder heads, which we have just described. This construction is quite

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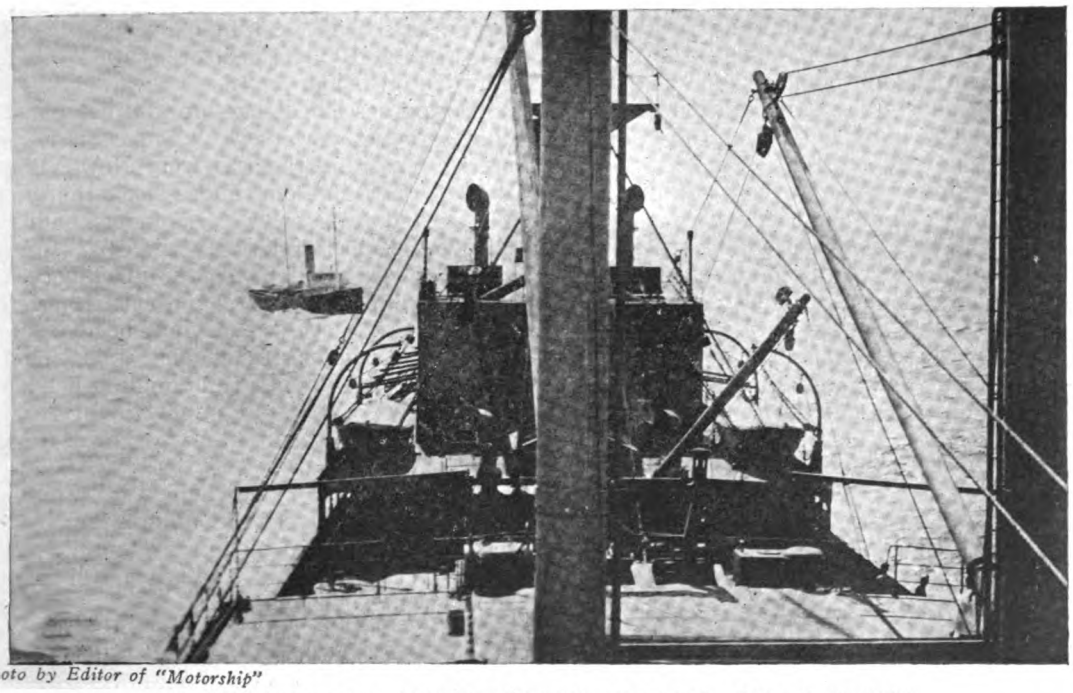


Photo by Editor of "Motorship"

The pilot-boat came alongside when we reached the Over Falls light

clearly seen in the illustration. It leaves the cylinder quite free to expand downwards, sliding through the entablature, which bearing prevents lateral movement. Construction of the cylinder also is very interesting. The cylinder exhaust-and-scavenging belt comprises one casting, and the cylinder water-cooling space is formed by a corrugated sheet-steel sleeve as can be seen, the corrugations allowing for the expansion.

Side thrust from each connecting-rod is taken-up by four water-cooled guides. When comparing this type of construction with similar designs as adopted in some large steam-engines, it must be borne in mind that with present-day Diesel engines, forced-lubrication is general, that the thrust each revolution—contrary to steam-engine practice, passes from the front guide to the back. Furthermore, the engine framing is not liable to distortion, due to conducted heat as with steam-engines.

For these reasons the guides and slippers can, with Diesel engines, be much more closely set-up in erection without fear of working conditions giving rise to reduced clearances and overheating—the possibility of which is further reduced by the ample flow of lubricant under pressure which it is possible to arrange.

In additon, this arrangement of guides makes possible the removal of the main pistons from below, which with this type of framing sometimes is the method adopted, and is a procedure preferred by some ship's engineers to the method of removing the cylinder heads and withdrawing the pistons from above, as the latter entails a great deal of effort in addition to dismantling all or much of the valve-gear and disturbing its timing, and requires overhead room.

Consequently, many hours of labor can be saved when overhauling, which apparently pleases the operators as it gives them more time ashore. And, when the engineers are "in love" with their engines it means more care on their part with resultant better reliability. Moreover, the design of framing adopted secures exceedingly simple access for inspection through the large sheet-metal doors to all the main bearings, crank-pin bearings and cross-head bearings.

All these, of course, are more or less matters of opinion and doubtless there are other things which have to be taken into consideration, as the majority of designers are in favor of removing the cylinder-head to get at the pistons. For technical discussion of this subject our columns are always open to designers, builders and operators. Nevertheless, pleasing the ship's engineers by facilitating their work—which can be done in many ways—is half the battle towards super-reliability and is possibly

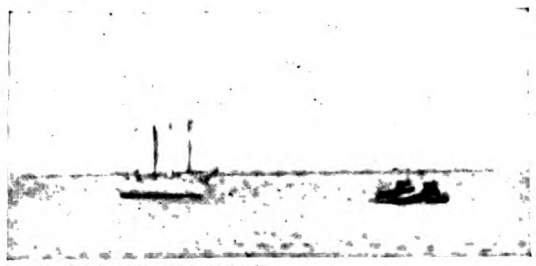


Photo by Editor of "Motorship"

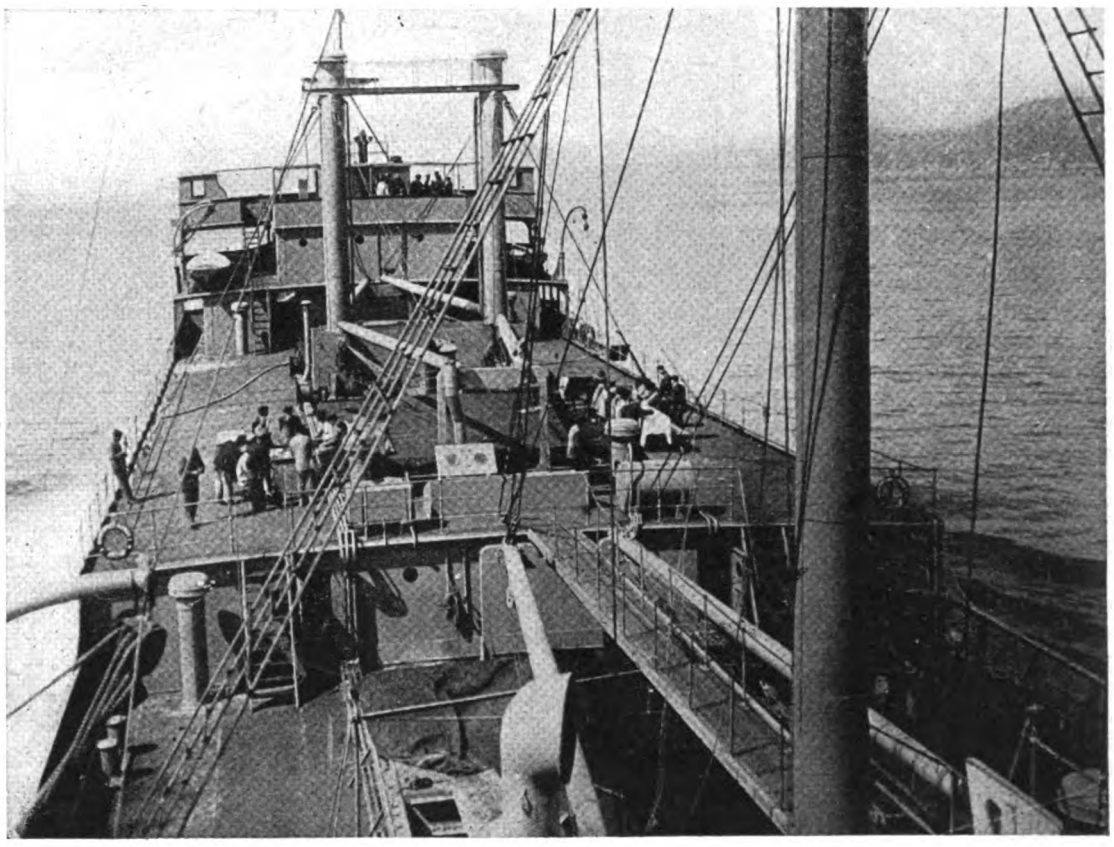
Two tugs towing a sailing-schooner up the Delaware. The previous day a tug towed a schooner down and charged $1,000.00

a line of resistance easier to follow than endeavoring to educate the operator to the systems believed the best by the designer. It should be mentioned that the simple construction of the valve-gear of the "Ansaldo San Giorgio I's" engine enables quick removal of the head, so sometimes the pistons are drawn from above for examination.

Telescopic-tubes with fresh-water circulation are used for cooling the working-pistons, the water first being warmed by running through the air-compressor inter-coolers. A neat device on the glands of these tubes is a small hand-wheel for adjustment, so that directly a leak appears the gland can be tightened-up just sufficiently to stop the leak while the engine is running; but there are, of course, limits to which the screwing-up process can be carried. However, the precaution is a good one and the arrangement of guards to prevent leakage of water passing into the crank-pit is neat and effective. Permanent electric-light fixtures inside the crank-pit and frames enables easy inspection through hand-holes at all times, and is an excellent device.

The construction of this pair of engines was commenced before Ansaldo's acquired the Fiat-San Giorgio Ltd. and the Sulzer patented double-row of ports was not incorporated, so there is only a single ring of ports for the admission of the scavenging-air, which is controlled by eccentric-operated piston-valves. The ports and the valve openings are so arranged as to give a super-charge of scavenging-air. The scavenging-ports open before the exhaust-ports, but cannot admit the air, as the valve is still closed, and this valve does not open till the exhaust-port has been open for an appreciable period, so that the burned-gases are "exhausting" before the scavenging-air gets to work on them. Thus diffusion is minimized. The scavenging-air admission-valve remains open after the exhaust-ports are closed, so that air at a pressure equal to that delivered by the scavenging-pumps blows into the cylinders right up to the moment when the scavenging-ports are closed by the piston. The result is a super-charge of clean air.

Some two-cycle engines have their scavenging-pumps driven by rocking-levers off the crossheads, but in this case they are driven-off an extension of the crank-shaft at the forward end. With a view to shortening the engine two double-acting scavenging pumps are fitted, one above the other. The upper piston is



Deck of Italian motorship "Ansaldo San Giorgio I" looking forward

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driven from a central crank-pin on the main shaft, the rod of which passes through the center of the lower piston, which, in its turn, is driven by two rods from a pair of crank-pins arranged at right angles to the center pin. This arrangement has the effect of giving four scavenge-air deliveries per revolution, and so tends to steady the flow of air. The central rod is prolonged through head of the upper scavenge-pump, and carries the piston of the low-pressure air-compressor, the valve of which is controlled by an eccentric.

Forward of the scavenging-pumps is arranged the high-pressure and second-stage air-compressor. Forward of this again is the pump group. These double-acting plunger-pumps are driven from the main crank-shaft. Inboard in tandem are the sanitary and bilge pumps and outboard, also in tandem, are the sea-water-pumps for circulating the cooling-water through the jackets, and the fresh-water pump for supplying the cooling medium to the main pistons. The latter pump draws from a separate tank of 6 tons capacity. Below these four pumps is a gear-wheel type of pump for forced lubrication oil.

Around these pumps are grouped the coolers for the air between the low-pressure and intermediate-pressure stages and the lubricating-oil, and two-way filters for the lubricating-oil. We understand that the latter filters are to be disconnected. In their stead two electric-driven De Laval centrifugal oil-separators will be installed in the engine-room—a step which we gathered the ship's engineers are in favor of.

In the wings of the engine-room are day-service fuel-oil tanks, and at the forward end are the steam-driven auxiliaries of the usual reciprocating type, namely,— a steam-driven ballast-pump, a fuel-oil pump and a stand-by water-circulating pump. The steel air-bottles for highly compressed-air storage of 70 cubic-feet capacity, are located on the forward bulkhead. At the after end of the engine-room are the lubricating-oil tanks, and above the thrusts are two steam-driven electric-generator sets each of 50 amperes 112 volts output, and each sufficient for the lighting of the ship. There also are two 20 b.h.p. Ansaldo Giorgio surface-ignition oil-engines driving three-stage air-compressors. In addition there is a generator driven by a belt off the starboard propeller shaft.

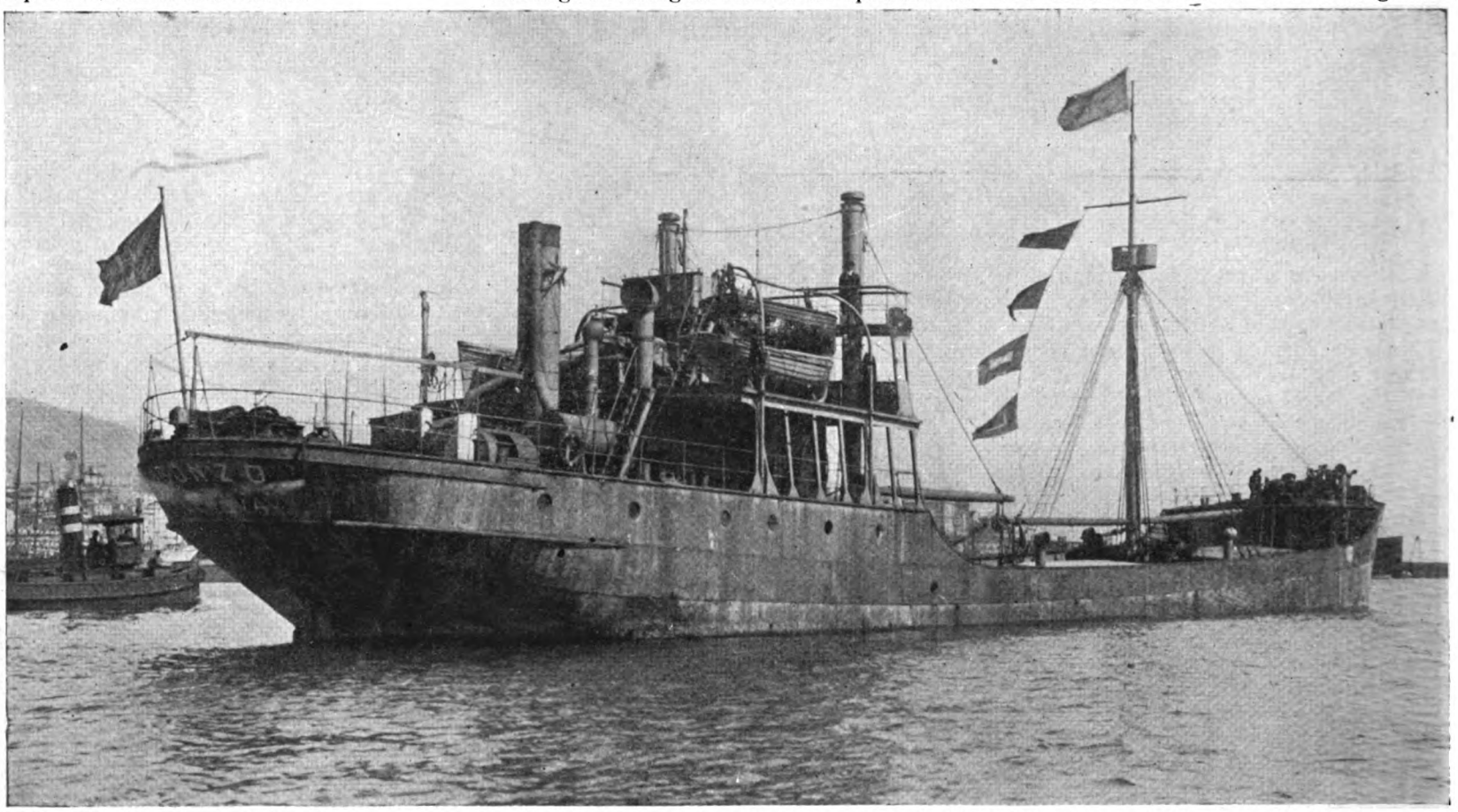
The engine-room crew consists of eleven men, namely, chief-engineer, three assistant-engineers, three oilers, three helpers and one junior-enginer. Two of this crew also attend to the donkey-boilers, which are only used when in port. When at sea, warm compressed-air taken from the second stage before it enters the cooler is used to operate the steering-gear and other auxiliaries at 75 lbs. pressure; but when entering or leaving harbors one of the oil-burning donkey-boilers is fired and steam used to steer the ship and for the siren. Chief Turturro was a steamship engineer and only had two months' Diesel-motor experience in the shops at Turin before taking his present position. On the voyage to New York both engines ran without a halt, except five minutes stop with one engine to replace a compressor valve spring, indicating that the training of intelligent men in the operation of Diesel motors is not such a difficult problem as generally believed.

Lubricating-oil consumption of the main propelling-engines together is approximately 50 gallons per day of Vacuum grade d.t.e This includes auxiliaries.

There are two Blake oil-fired vertical donkey-boilers in a house over the engine-room and these are of 200 i.h.p. each, one being sufficient to operate all the auxiliaries that are not driven by the two small hot-bulb motors. At sea neither of the boilers is used and when in port only one is fired, the other being a stand-by. Its consumption is 1½ tons per 12 hour day and as mentioned two of the engine-room crew attend to the firing. All the deck-winches are steam operated. There are eleven. At present there is no heating arrangements in the ship, as she goes South in winter, but a system is to be installed that will use the hot sea-water from the main engine cylinder jackets. Each of the donkey-boilers are 19 ft. 6 in. high by 8 ft. diameter and work at 100 lbs. pressure, with Wallsend-Howden oil-firing.

Having described the ship and her remarkable carrying powers we will pass a few remarks regarding the run from New York to Philadelphia and our impressions therefrom. We started from New York under conditions unfavorable as to speed as there was practically no cargo aboard, so the machinery and fuel aft dipped her stern and raised her stem forward, and there was a strong head-wind all the way which had a tendency to swing her bow from side to side, thus holding her back. Speed, however, was a minor factor for our being aboard, as our main work was to observe her reliability.

Here was a two-cycle engined ship that had been in service nearly 18 months and whose records revealed no machinery trouble whatever. Were there any minor engine *pannes* about which nothing was said, but which would delay the ship? This was the question to be answered on the voyage! When in New York we had boarded her while docking and had made half-a-dozen visits during the following days. At no time did we see repairs of any nature taking place. In fact only one spare cylinder, one spare piston, one extra cylinder-head, etc., is carried and these have never been used.



The 1,600 tons d.w.c. Italian 2-cycle motorship "Isonzo," built by the Societa Cantiere & Officine Savoia, a subsidiary of Gio Ansaldo & Co. She is propelled by twin 420 b.h.p. Sulzer-type Diesel engines

She pulled-out of Pier 25, North River, at 7:40 P. M., proceeded down the bay and passed the Ambrose light at 9:05 P. M., Philadelphia time, stopping en route to drop the pilot. Overfalls break-water was reached at 9:50 A. M. the next morning, an average speed of 11.25 knots having been made with the engines running steadily at 103 and 105 r.p.m. respectively, never faltering or varying the entire time. Here a stop was made to pick up the Delaware pilot and the run up the river was continued with wind and tide against the ship. The chief-engineer speeded up the engines a little as it was desired to dock before darkness set in, while going up the river estuary they ran at 108 to 110 r.p.m.

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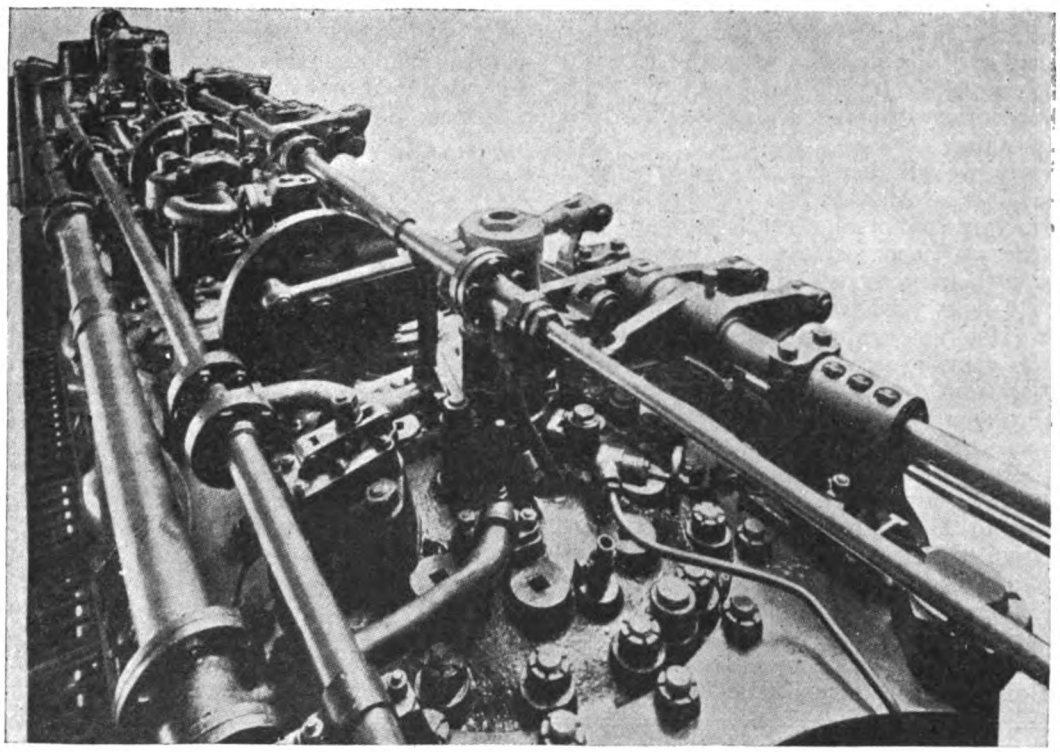
Pier 40 was reached at 7:30 P. M. Philadelphia time, or 6:30 New York time, so the entire run of 227 nautical miles was accomplished in 22 hours 50 minutes from dock to dock, without deducting the time lost dropping and picking-up the pilots. The only mishap—if it can possibly be termed such—was that one of the pistons had a broken ring nearly all the way, but this in no way impeded the reliability of the engines, which ran at over their rated load for the entire voyage. Never once did the engines falter or hesitate, but ran with clockwork consistency.

The past record of the "Ansaldo San Giorgio I," together with her performance as above, have convinced us of the reliability of her two-cycle engines, and we recommend similar first-hand evidence to any shipowner who is still doubtful.

We must express our indebtedness to Captain Razeto and to Chief-Engineer Turturro, who with extreme courtesy did everything possible to assist us in our observation and to make our trip pleasant. Captain Razeto, who is delighted with the performance of his ship, is from an old Genoese family. In his presence one's thoughts unconsciously drift back to impressions of the charm of the old Georgian period when courtesy and natural grace was an art born with the body. He has a delightful personality! The next time we meet him we hope it will be on the bridge of the "Francesco Crispi," which will be the first of the company's new big fast passenger-cargo motor-liners. It would assist to cement friendship between Italian and American shipping interests. Even the Philadelphia pilot—a worthy old salt—saw fit to pass pleasing comments on Captain Razeto.

We noticed that the crew were quite a cheerful and contented bunch. Captain Razeto gave as a reason for this the absence of firemen, and that the restlessness, dissatisfaction and unruliness so common aboard steamships is entirely absent. He said that firemen are always of "nervous temperament" because their very work and the heat conditions down below make them so.

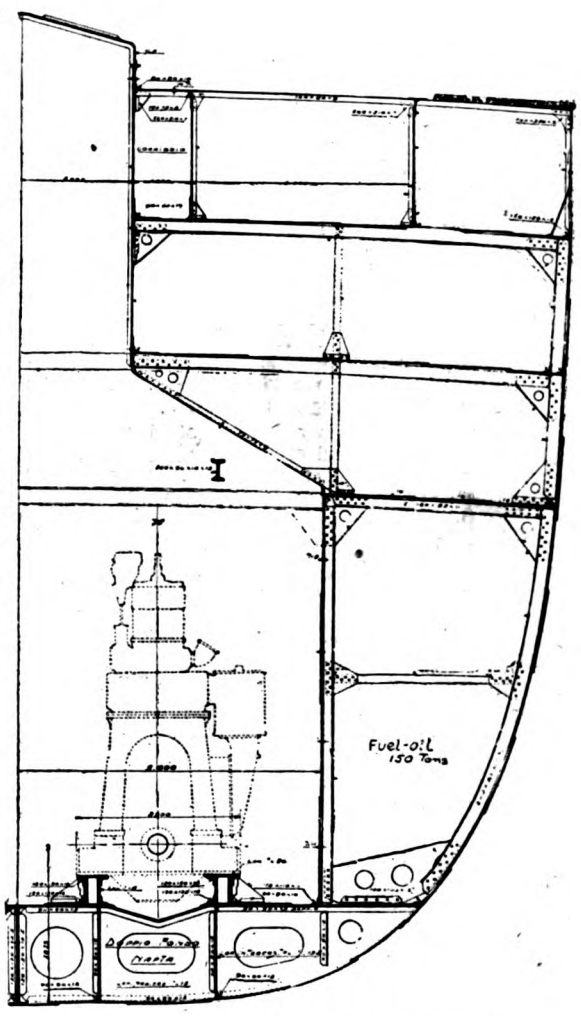
Chief-Engineer Turturro, and a man of the painstaking type, careful as to detail, and is of a class of excellent engineer required for Diesel-engine operation where close watch on the machinery is always required. That he has his men well-in-hand could be noticed by their activity and constant attention to the operation of the engines.



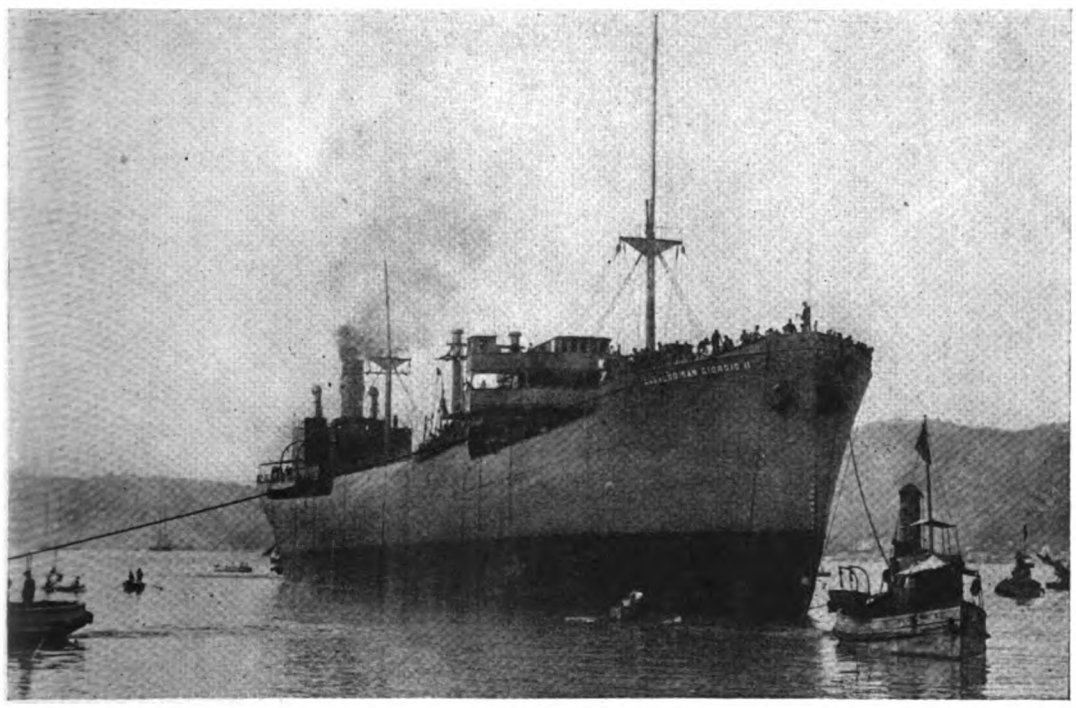
View of cylinder-head and valve mechanism arrangements of one of the Diesel engines of the "Ansaldo San Giorgio I"

On the way to Philadelphia, we passed very few steamships. Just before reaching Overfall break-water the Vacuum Oil Co.'s McIntosh & Seymour-engined motor-tanker "Bayonne" passed us, making one of her regular runs to New York, of which she has now made about one-hundred during the year she has been in service. Shortly after the Kromhout-engined motor-tanker "Pendrecht" of Holland passed by; and off Hog Island, the motor-freighter "Astmacho IV," also McIntosh & Seymour engined, passed us on her way down the Delaware.

We must not omit to mention the absence of vibration. Sitting in the Captain's saloon it is almost impossible to tell if the engines are running, even though the vessel be in ballast. The engines are silent in operation and the sound from the exhaust-stack is very slight. The hull is very seaworthy, having plenty of sheer. Captain Razeto informed us that she never rolls when loaded, even in very rough weather.



Section at engine-room of 15,000 tons Italian motorship now building



The second motorship of the Societa Nazionale di Navigazione's fleet entering dock to load. The smoke is from the oil-fired donkey-boiler. Their latest motorships will have Diesel-electric auxiliary machinery

Off the Overfalls light we noted a four-masted schooner endeavoring to tack against the head-wind into the river, a tug put out to give her assistance which she would not take. Nor are we surprised as the pilot informed us that the tug had come down the previous day towing another sailing vessel and had charged $1,000.00. Saving in tug dues and avoidance of loss from delay en-route can well be imagined had auxiliary oil-engines been installed on these two vessels. We also

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passed another sailing boat in tow of two tugs. We presume this vessel also would have to pay about $1,000.00 for the haul. We took the opportunity to take a photograph which we reproduce.

Finally, we will mention that we have been advised by the Ansaldo San Giorgio Limited that the large motorships which they are constructing will incorporate all the experiences made on their previous ships, and will represent the most advanced stage of motorship construction yet contemplated. The motorship has come to stay in Italy and is gaining in favor from day to day among shipowners and ship operators.

We are enabled to give drawings of the largest motorship that Ansaldo San Giorgio Ltd. have under construction. Particular attention is drawn to the unusual facilities for handling the cargo, which will render her stays in port comparatively short. Increasing use of Diesel-electric machinery for operation of the ship's auxiliaries is developing an excellent tendency to equip motorships with faster and more powerful cargo loading and unloading apparatus, and the power for the same is always quite distinct from the main engines. The vessel we are just discussing has the following dimensions:

Displacement (loaded)	22,000 tons (about)
Deadweight-Capacity	15,000 tons
Net Cargo Capacity on Round Transatlantic Voyage	14,250 tons
Length (O.A.)	511 ft. 5 in.
Length (B.P.)	491 ft. 9 in.
Breadth (extreme)	65 ft. 6 in.
Gross Tonnage	11,477 tons
Power	4,000 shaft h.p.
Speed (loaded)	11.5 knots

It may be of interest to give here a short account of the first trip of the "Ansaldo San Giorgio II" from Genoa to Valparaiso and return, which was made following a similar trip of the "Ansaldo San Giorgio I." We are obliged to omit in this issue a chart with complete indications of the stops in ports, fuel-consumption, the time spent on the whole trip, and for the relative operations of loading and unloading of the cargo in the different ports, owing to the same being in the Italian language. The whole trip from Genoa to Valparaiso was made in sixty-one days, stopping for commercial operations in nineteen ports such as Marseilles, Barcelona, Cadiz, Teneriffe, Port of Spain, La Guaira, Puerto Cabello, Curacao, Sabanilla, Colon, Palermo, Buenaventura, Guayaquil, Callao, Mollendo, Arica, Iquique, Antofagasta, Valparaiso.

In this trip 8,851 nautical-miles were covered at an average medium speed of ten knots. Altogether 1,317 hours were occupied, of which 861 hours were at sea, and 456 hours in the different ports for loading and unloading purposes. The fuel-consumption per shaft horsepower hour corresponded to about 25 per cent of the fuel-consumption of an ordinary coal-burning cargo-steamer of the same capacity.

Altogether the Ansaldo San Giorgio Company have constructed 300 Diesel engines aggregating 200,000 shaft h.p., and another Italian firm has built about a similar amount, which will give a comprehensive idea of the size of the industry in Italy.

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Auxiliary Propelling-Installations on Italian Sailing-Vessels

Details of Some Recently Diesel-Equipped Ships

By C. E. SPINNLER

Most shipowners are now aware that sailing-vessels can with relatively small expense and small loss of time be easily transformed to auxiliary power, i.e., equipped with some kind of propelling machinery to render their movements at sea and in harbor completely independent of weather conditions and to secure a steady speed of at least seven to eight knots when under power alone.

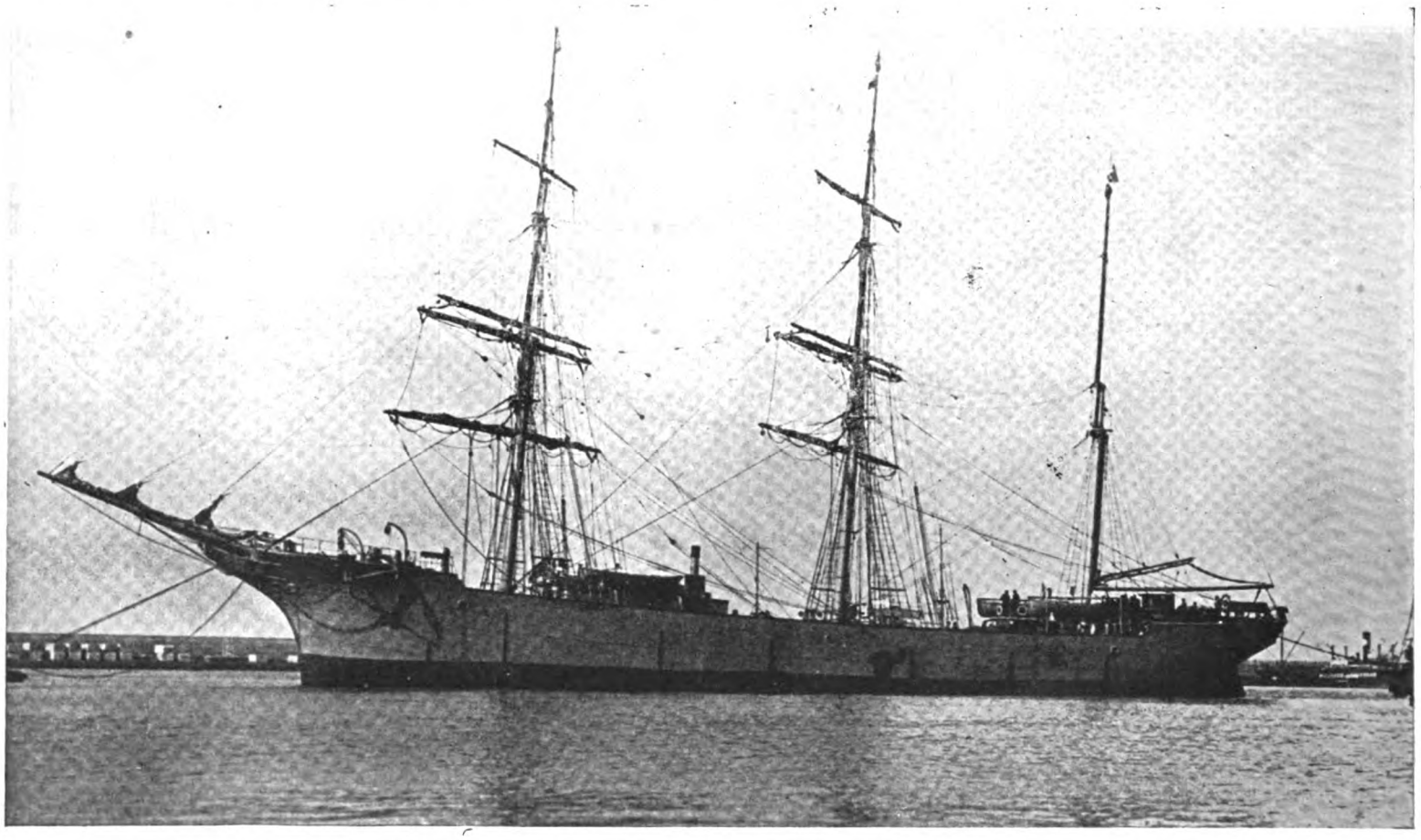
Before the war very good results had been obtained with many motor-auxiliary sailing-ships. For many years Scandinavian countries in particular have made great use of auxiliary-schooners equipped with small and medium-sized surface-ignition oil-engines such as the Bolinder, Skandia, Fairbanks-Morse, Grei, Avance, Munktell, etc. Such vessels are used all over the world in ocean services as well as in coastwise trades. A lesser number have Diesel engines installed.

During the war many Italian steel and wood sailing-vessels, new and old, were equipped mostly with surface-ignition engines, and it was very difficult to obtain internal-combustion engines of the Diesel type on account of the extremely busy condition of most of the factories engaged in manufacturing urgently needed machinery of this type for the Allied submarines, as well as in the production of heavy-dutyy slow-speed Diesel marine-engines for the equipment of full-power motorships ranging in capacities from a few hundred tons up to 8000.

After the armistice many Diesel-engines of the submarine type, as well as slow-speed engines, became available in England and in Italy, and quite a number have been placed in sailing-vessels as auxiliary propelling machinery ranging in sizes from 250 h.p. up to 1000 h.p. per engine. In England a number of sailing-vessels, such as the "Horn Shell," have been equipped with Vickers' submarine type Diesel engines, and from all reports have given excellent service. Details and illustrations of these ships were given in "Motorship" for August, 1920.

Also in Italy quite a number of old and new wooden and steel sailing-vessels have been equipped with Diesel engines of the submarine type (two and four-cycle), as well as of the most modern heavy-duty crosshead type. The first Italian sailing-ship to be equipped with a high-powered submarine Diesel-engine was the "Olona." She has a two-cycle type Tosi-engine originally rated at a speed of 330 r.p.m. at 1500 shaft h.p. for naval work, but adjusted to develop 550 shaft h.p. at a speed of 150 r.p.m.

Smaller engines, namely the 400 shaft h.p. six-cylinder four-cycle model which also were intended for submarines have been available since the armistice and two Italian sailing-ships, the "Mascotte" and the "Zilia" both of about 1200 gross tons, have been equipped with a pair of the engines rated down to 260 shaft h.p. at a speed of 250 r.p.m.



Auxiliary sailing ship "Po" equipped with twin 320 shaft h.p. Sulzer two-cycle type Diesel engines

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In addition to those craft, several other sailing-vessels converted to auxiliary power have been placed in service, and I may mention the large Sulzer-engined auxiliary schooners "Po" and "Italia." The first is a twin-screw boat, whereas the second has only one engine. Through the courtesy of the owners of the "Po" and "Italia" I am able to give some interesting data regarding the general arrangement of the engines and auxiliaries, as well as the operating datas obtained during the first trip of the "Po," after conversion to an auxiliary-schooner, to South America.

The "Po" is a steel schooner of 3,300 tons d.w.c., owned by the well-known Italian ship-owners and operators, Quaglia & Galdini, of Genoa. This vessel was built in 1884 in Liverpool at the yard of Messrs. W. H. Potter & Sons. In 1918, she was bought by the present owners for the specific purpose of transforming her into a motor auxiliary-schooner. Under Lloyds' supervision the whole hull was examined and found in excellent condition. Necessary modifications for the conversion to an auxiliary, together with the installation of the propelling machinery, were made in about six months. She has the following dimensions:

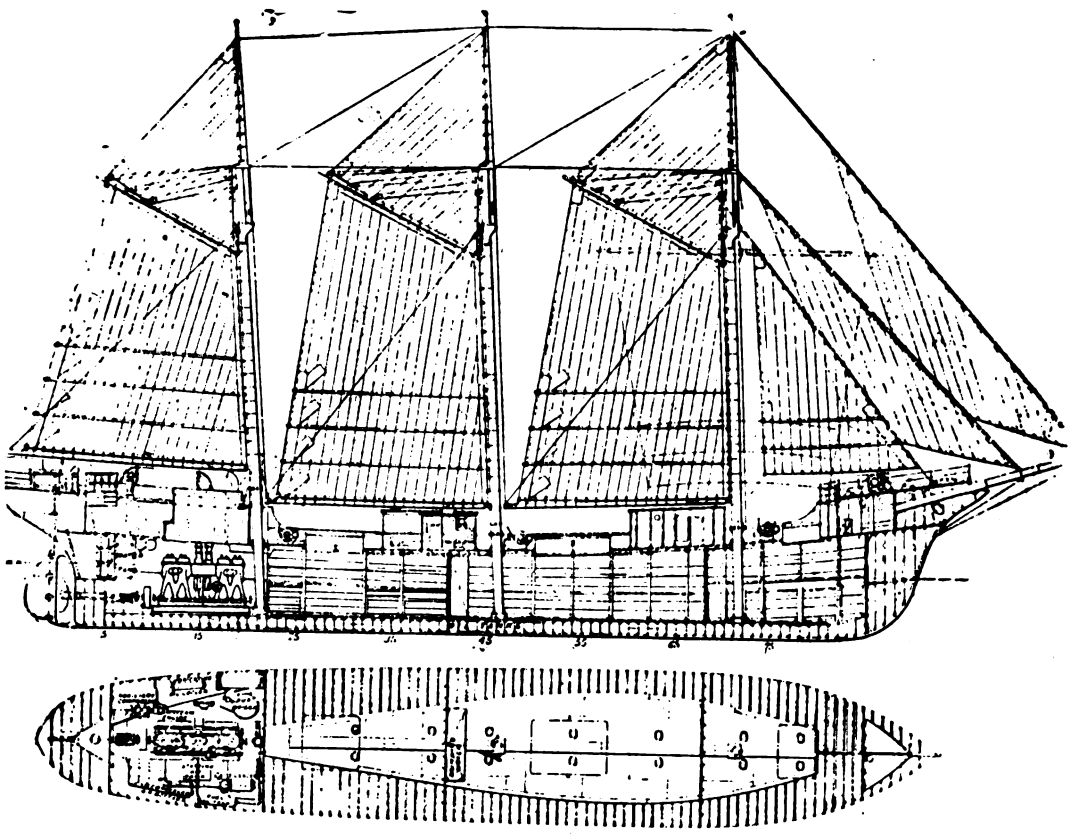
Loaded displacement	4500 tons
Length (overall)	300 ft. 0 in.
Breadth	40 ft. 6 in.
Depth	24 ft. 3 in.
Loaded draught	20 ft. 0 in.
Net tonnage	1,998 ½
Sailing speed (normal)	9 knots

Her power-plant consists of twin 12¼ x 18 in. four-cylinder Sulzer Diesel engines of 320 shaft h.p. running at a speed of 200 r.p.m.

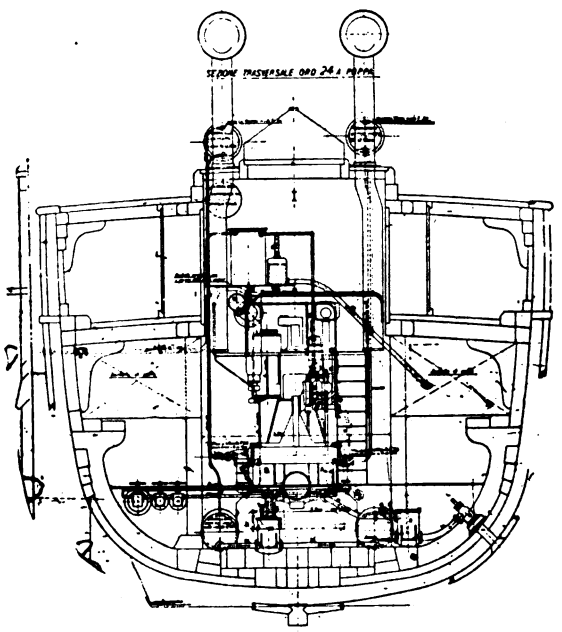
The engine-room is located aft, and each engine is direct connected to the thrust and propeller shafts. One of the illustrations shows the engine-room layout. Each engine has one scavenging-pump and one three-stage air-compressor, both located at the forward end and driven direct from the engine crank-shaft. Each engine has its own exhaust silencer, the exhaust being taken out through the aftermast. Her fuel-tanks have a total capacity of 70 tons and are located as shown in the layout. Two service tanks of 125 gallons are provided, and these are fed every six hours from the main fuel-tanks through a horizontal compressed-air driven simplex pump.

There are two injection-air storage bottles of a capacity of 70 litres in direct connection with the main air-compressors. Pressure of the injection-air is about 1000 lbs. per square inch. For starting purposes there are provided two starting-air bottles of 110 litres capacity each, and 18 storage flasks of a total storage capacity of 1500 litres of compressed-air at a pressure of 1000 lbs. per square inch. A control-stand is mounted between the engines on the forward engine-room bulkhead and contains a distribution-valve box with control-valves for cooling-water, fuel-oil, starting and injection-air together with all the necessary gauges.

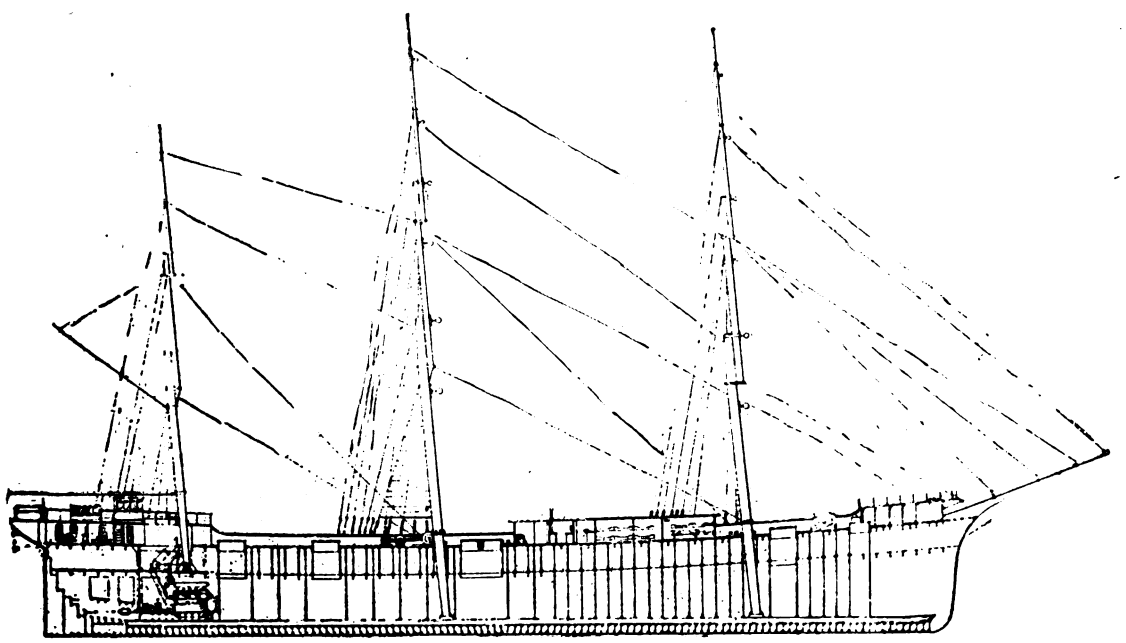
The engines are provided with a forced lubricating system. Seawater is used for cooling purposes. The engines themselves are built with ample water-jackets and all the piping is very abundantly dimensioned so as to secure perfect service under every circumstance. The piping itself is laid out so that an easy inspection and overhauling is possible at any moment and with little loss of time. All the main water and oil circulating-pumps are direct driven from the main engines.



Sectional drawings of the "Merioneth"



Section of motor auxiliary "Drago" showing arrangement of engine-room



Sectional drawings of the auxiliary-motor schooner "Po"

For engine-room auxiliaries there are: one single-cylinder "Weber" surface-ignition oil-engine of 6 to 7 h.p., running at a speed of 500 r.p.m. driving a rotary water-pump of 40 tons capacity per hour for general services, which pump also serves as an auxiliary water-circulating pump for the main engines as well as acting as bilge-pump. By means of a claw-clutch a fuel-supply pump is connected to this Weber engine, also a two-stage reserve compressor with an air-capacity of two litres per minute at a pressure of 1140 lbs. per square inch.

A 3 k.w. Bolinder electric lighting set is installed, consisting of a 5 h.p. Bolinder surface-ignition oil-engine, direct connected to a 3.5 k.w. 220 volt Oerlikon (Swiss) dynamo, running at 600 r.p.m. For emergency lighting "Petrol Press" lights of the Kitson type have been installed in the engine-room.

The deck auxiliaries are steam and motor driven. A little Cochrane boiler supplies the steam for two of the three winches and for the windlass. The third winch is driven by a small gasolene engine which is mostly used as a cargo hoist, and during navigation for the handling of sails and rigging. Its capacity is one ton.

At the trial trip made with vessel half loaded, an average speed of 8.75 knots was obtained with engines working at the full-speed of 200 r.p.m. On her maiden voyage from Genoa to Buenos Ayres, South America, the "Po" covered the distance of 6,435 nautical miles in 39 days, averaging a mean speed of 180 miles in 24 hours or a little less than 7½ knots. From Geona to Gibraltar the vessel sails under engine power without sails. From Gibralter to Buenos Ayres, taking advantage of every favorable wind, mixed navigation was used very extensively. Approaching ports the full value of auxiliary power became most evident, as she could make harbor without any outside assistance, thus saving all the otherwise necessary heavy tug charges.

Here I will mention the different distances covered by the vessel with and without auxiliary power:

Navigation under engine power	2028 miles
Navigation under sails only	2719 miles
Navigation engine power and sails	1690 miles
Total mileage covered	6435 miles

From the above figures can be seen that 42.4 per cent of the total distance was covered under sail alone. This element forms the basis of operation, in the opinion of her owners, of auxiliary schooners, to enable them to compete successfully with the ordinary full-powered steam-driven cargo-boats on certain routes where there are favorable winds for great distances and so maintain an average speed of from 7 to 8 knots.

The whole installation was carefully planned to meet all the exigencies of service on board of an auxiliary-schooner in the most economical and suitable way, which important features have been overlooked and neglected with many vessels in the past. Electric-light and good living quarters

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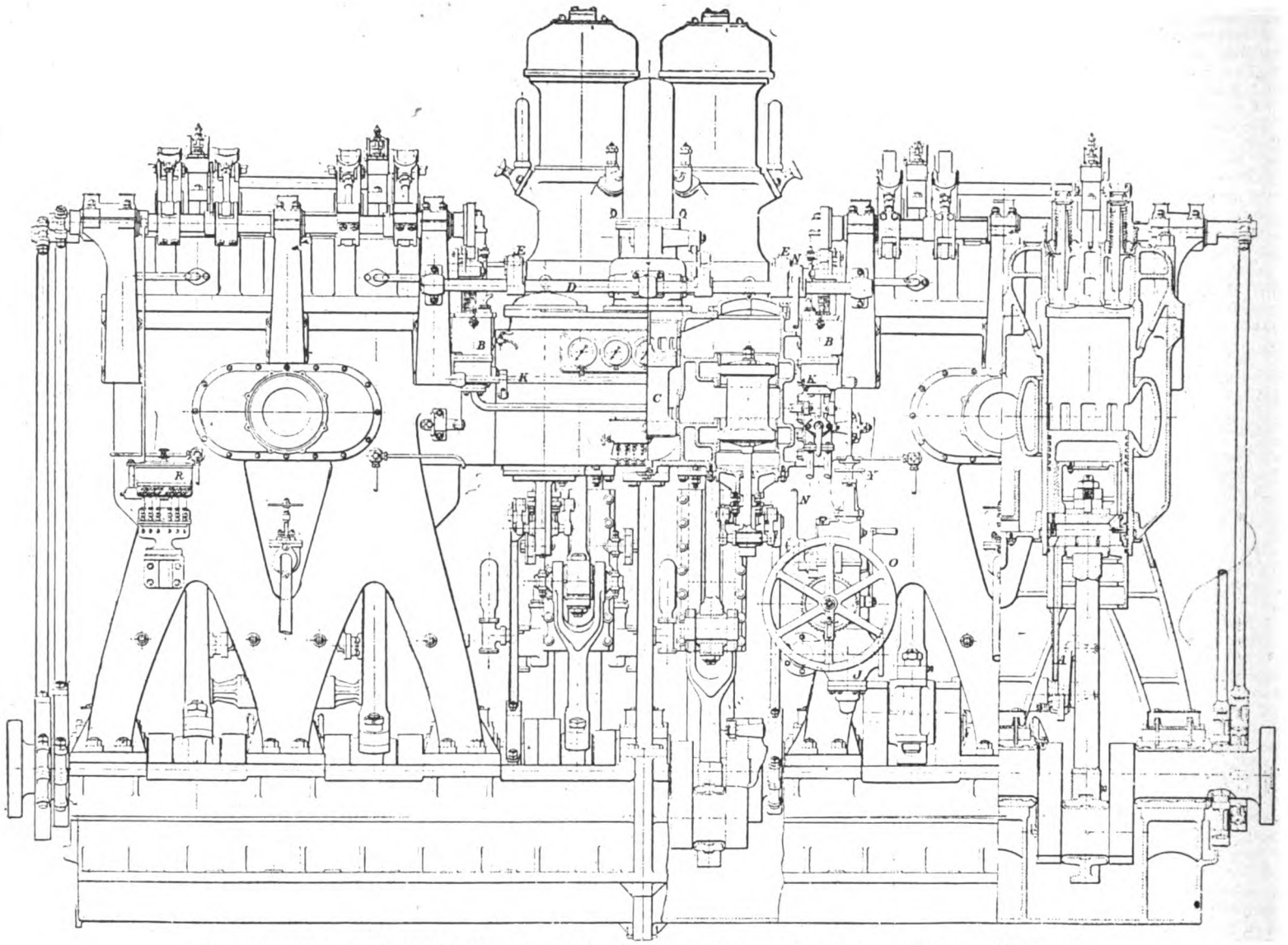
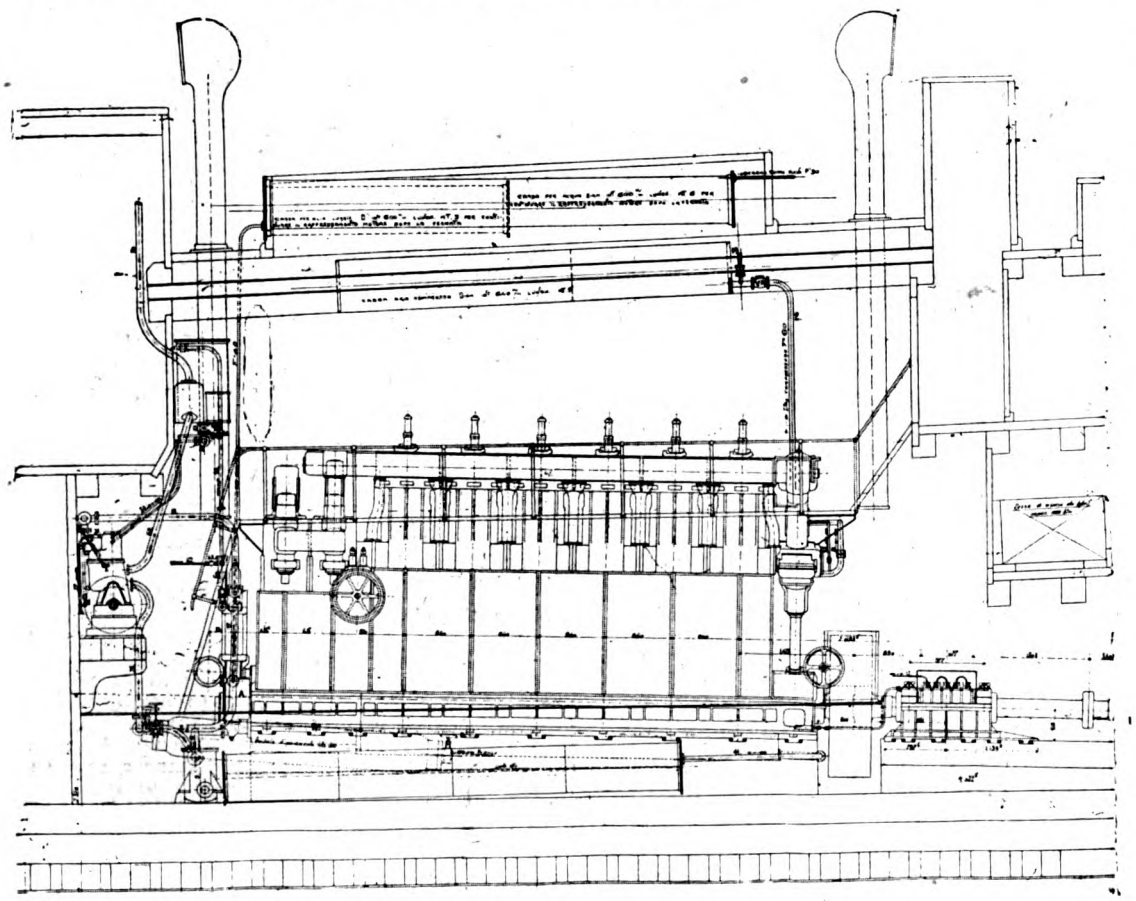


General arrangement of the Hock-Fenchelle Diesel engines of the Italian auxiliary "Merioneth"

for the whole crew will make an auxiliary schooner as desirable to them as any modern steamer. European shipowners could follow American practice in this respect with advantage to themselves. Put the crew in good quarters and treat them as human beings. Generally the owners will get back more by increased efficiency of the crew itself than the original extra expenses amount to, and the ship will be fitted in a manner corresponding to the present standard of living and human treatment. We still see too many European auxiliary-schooners on the seas with which no special care has been taken for those who have to operate and run the ship and on whose efficiency and management depends her whole success.



Engine-room of the motor auxiliary "Drago"

Another addition to the Italian auxiliary-schooner fleet is the "Drago," which is owned and operted by the Societá di Costruzione e Navigazione "Armatori d Oneglia," of Genoa. She was built during 1918-20 at the yard of the same company near Genoa. She is a wooden vessel of 824 gross tons, and equipped with one 6-cylinder 550 to 600 shaft h.p. Tosi 4-cycle marine Diesel-engine of the crosshead type, placed in the stern, and direct-connected to the thrust and propeller shaft. The cylinder bore is 17¾ in. by 26½ in. piston-stroke, and the engine runs at a speed of 150 to 165 r.p.m. Regarding the engine, it is direct-reversible and is manœuvred by means of the two-cylinder, three-stage air-compresser, acting as starting and reversing engine when driven by compressed-air from the reservoir tanks. No starting-air is admitted to the working-cylinders. As a detailed description of this type of Tosi engine was published in the September, 1919, issue of "Motorship" it need not be re-described here.

The fuel-tanks are located alongside the engine-room and have a combined fuel-capacity of about 40 tons. With a daily fuel-consumption of about 2¾ tons, including the auxiliaries, the "Drago" has a cruising-radius of 14½ days. Obviously there must be some additional fuel-tanks on deck, so as to increase the cruising-radius to at least 30 to 40 days under full load, which would require a total bunker-space of about 120 tons.

The arrangement of all the lubricating-oil tanks, starting-air tanks, compressed air storage-tanks is well carried out. The engine itself is placed in the ship's stern with as little as possible loss of valuable cargo space. The engine-room auxiliary set is placed alongside the engine-room bulkhead and consists of one combined standard Tosi Air-Compressor and reserve pumps set, driven by one 6 h.p. surface-ignition type oil engine. The three-stage air-compressor is of suitable size to fill in a relatively short time the starting-air and injection-air bottles. On pumps there is one rotary auxiliary water-circulating pump and a rotary auxiliary lubricating-oil circulating pump. Both pumps are of sufficient size to supply the cooling-water and lubricating-oil for both the main engines in case the main pumps driven by the engine should get out of order. They also serve to get the whole lubricating system in service before starting

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the engines, so to be sure of its perfect operation as well as to let the circulating-water run thro' the engine after stopping for a short time to let the engines gradually cool off.

The pumps are arranged on one side of the oil-engine and connected to it by means of a claw-clutch. The compressor is located on the other side of the engine and also driven thro' a similar clutch. The oil-engine is hand started.

The main water and lubricating-oil circulating pumps are driven direct from the engine shaft and each has a capacity as follows:—

One Circulating Water-Pump, capacity, 6000 gal. per hour. One Lubricating-oil Circ. Pump, capacity, 4500 gal. per hour. One Engine-driven Bilge-Pump, capacity 2500 gal. per hour. One Daily fuel-supply Pump, capacity, 250 gal. per hour.

The auxiliary, or reserve, pumps have capacities as follows:—

One Circulating-water pump, capacity, 5000 gal. per hour. One Lubricating-oil Circ. pump, capacity, 1000 gal. per hour.

The weight of the whole installation, including all the piping, thrust-bearing, shaftline, propeller and stern tube is about 100 tons, or about 375 lbs. per shaft h.p.

The "Drago" is used in the Mediterranean and Black Sea Trade and to date has given excellent service with regard to economy as well as to reliability of the whole machinery installed. Several other wooden and steel motor schooners will shortly be ready for service, owned and operated by the same Company.

During the war many wooden motor-auxiliary schooners were under construction in Italy, but with the signing of the armistice the building of wooden vessels has been abandoned and replaced with steel schooners of bigger capacity and higher auxiliary power.

Little has been said in the United States about the Hocke Fenchelle Diesel engine which has been taken up by an American company in Pittsburgh, Pa., and by another in Los Angeles, Cal., and about which more is likely to be heard in the near future. We are enabled to publish drawings of a Diesel engine of this design installed in the Italian schooner "Merioneth," which visited Norfolk last February. The hull was originally constructed in 1875 by Royden & Sons of Liverpool, and is of 1395 gross tons. Her present Diesel engine was constructed by the Cantiero Savoia, Savona, Italy, and the vessel is owned by Quagli & Galdini of Genoa.

The vessel has the following dimensions:

Gross tonnage	1395 tons
Deadweight	(about) 2250 tons
Length	231 ft. 4 in.
Breadth	38 ft. 9 in.
Depth	23 ft. 6 in.
Rated power	350 shaft h.p.
Service power (actual)	220 shaft h.p.
Bunker capacity	60 tons (420 bbls.)

It will be noticed that the power is much too low for the size of the ship. Consequently, the propeller is small, the revolutions being 150 r.p.m. in actual service, or 200 r.p.m. at rated power. Therefore, the ship only makes a speed of 4 knots under power alone, which is hardly sufficient to give her headway.

"Motorship" has always adopted a strong policy regarding the under-powering of auxiliary sailing-ships. The result of under-powering the "Merioneth" was that on her voyage from Genoa to Norfolk nearly two months were taken. The engine was running a total of sixteen days. We understand that it was not possible to run the engine any longer, owing to the limited fuel-capacity of the ship, which is about 420 barrels. The fuel used was very heavy Roumanian naphtha. Evidently the owners or the firm who carried out the conversion work were very careless regarding the installation, particularly as fuel was also required for the dual oil-fired and coal-burning vertical donkey-boiler.

On deck there are four steam-driven winches of 3 and 5 tons capacity, and a steam-driven windlass. At sea the boiler uses a considerable percentage of the fuel, even though the winches are not in operation.

The drawing of the engine will give an idea of its general design. It is of the 2-cycle type with valve-in-the-head scavenging, and double-acting scavenging-pumps are fitted, driven by cranks at 90 degrees, and provided with crossheads and guides, whereas the working-pistons are of the trunk type.

The piston-valve gears are driven by eccentrics and links as in steam-engines. There are two cam-shafts, one for scavenging-valve gears and the other for the fuel-injection valve-gear. Both shafts have oscillating movements only and are driven from the crank-shaft by means of eccentrics, two at the forward end and two aft. Reversing is carried out by shifting the injection-valve cam-shaft. When the engine is warm, starting and manœuvring can be carried out with an air pressure as low as 5 atmospheres, but the average starting-air pressure carried is 10 atmospheres in one reservoir tank.

Several other voyages have been carried out, including from Geona to Bombay and return, from Genoa to African Mediterranean ports and return, and from Genoa to the Black Sea, Varna Braila and return.

Another recent Italian motor-auxiliary is the "Viloria Italiana," 232 tons gross, built this year by the Cantiere Fratelli Tulino of Varazze. A Kromhout surface-ignition type of oil- engine is installed.

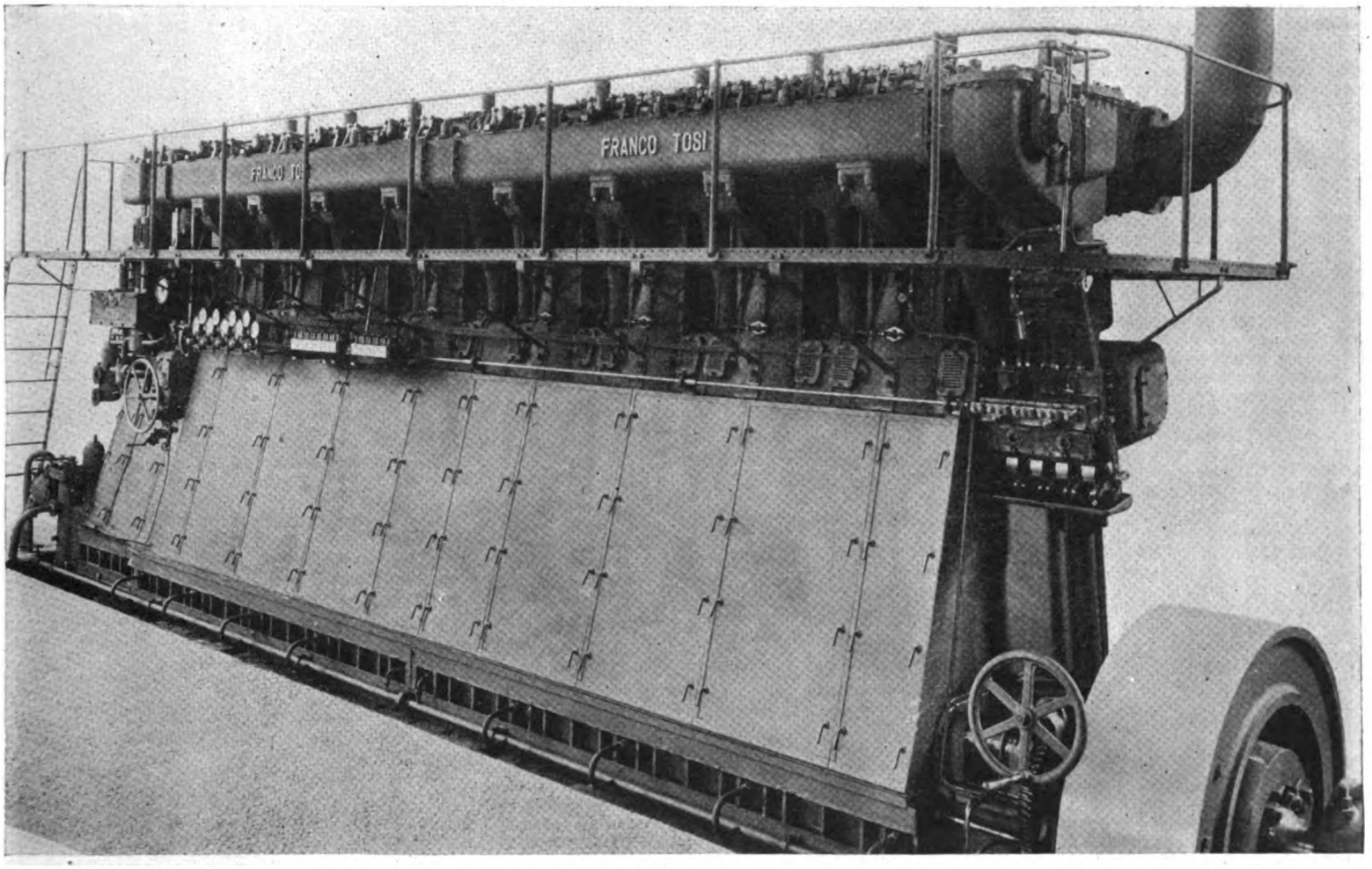
MORE ITALIAN CONCRETE MOTORSHIPS

Two concrete motorships of 1000 tons d.w.c. each are under construction at the Urania Shipyard at Muggia, Italy, and will be ready for service in January, 1921. Each vessel will have twin 250 shaft h.p. Ansaldo San Giorgio two-cycle type Diesel engines installed. All the engine-room and deck auxiliaries will be electrically operated, generators being driven by Diesel engines. At the same yard two 250 ton concrete motorships are nearly ready for their trial trips. Both of these will be propelled by Ansaldo San Giorgio Diesel engines of 120 shaft h.p. at 340 r.p.m.

During July, the first concrete motorship completed at this yard made its trial trip with satisfactory results. She is of 250 tons d.w.c. and is propelled by a 80 shaft h.p. Climax-Leisner surface-ignition oil-engine turning at 360 r.p.m. The loaded speed of the vessel is 5 knots.

MORE AMERICAN ENGINEERS STUDYING EUROPEAN MOTORSHIP PRACTICE

Among American engineers now in Europe investigating marine Diesel-engine design and construction with a view to purchasing a license may be mentioned W. B. Mayo, Vice-President of the Hoovens, Owen & Rentschler, the well-known steam-engine builders of Hamilton, Ohio. Mr. Mayo has a staff of engineers with him and already has visited a number of Diesel plants, where he found much of interest in the way of developments. We would like to compliment the firm on their enterprise. Incidentally it may be mentioned that Mr. Mayo is also Chief-engineer of the Ford Company, of Detroit. There are rumors current that the Ford Co. will build motorships for transporting their cars to Europe and other countries. Construction of the hulls will be carried-out in their own shipyard on the Rouge River.



One of a pair of eight-cylinder 800 shaft h.p. four-cycle type reversible marine Diesel engines built by Franco Tosi, Ltd., of Legnano, Italy, for service in a ferry-vessel that will operate in the Messina Straits

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Motorships vs Steamships

Comparative Operating Expenses and Earnings of Cargo Vessels

PART II.

BY CHARLES E. LUCKE

Professor Mechanical Engineering, Columbia University and Consulting Engineer, Worthington Pump and Machinery Corporation

(*Continued from page 823 Sept. issue*)

3. *Earnings and Expenses.*

All earnings are derived from cargo handled, and are to be estimated from the cargo-capacities per Table VII., by applying an assumed freight rate. Freight rates are necessarily variable, so estimates of earnings must be also variable, especially as rates on return cargoes may be different than for outbound or no return cargoes obtainable. Figures are available on rates, ranging from \$75. to \$3.50 per 1000-ton miles, and showing a difference of 50 per cent between outbound and return rates. As world trade conditions change so must these rates change, so any definite estimate made may be entirely wrong shortly afterward.

For the purpose of indicating form of procedure, a rate of \$3.50 per 1000 ton mile will be applied to the New York to Liverpool route, or $3.220 \times 3.50 =$ \$11 in round numbers per ton one way but applying to both directions. For the New York to Buenos Aires route \$2.50 per 1000-ton miles, or $5.870 \times 2.50 =$ \$15 per ton, and New York to South Africa \$3.00 per 1000-ton miles, or $\$3.00 \times 8.000 =$ \$24 per ton. The earnings are calculated on deadweight cargo-capacity in Table VII, using these freight rates. A similar calculation can be made on the basis of bulk or measurement cargo, but this is omitted to avoid confusion due to two sets of figures.

TABLE VII

Gross Earnings on Deadweight Cargo

VOYAGE	ITEM	STEAMSHIP Per Voyage	STEAMSHIP Per Year	MOTORSHIP Per Voyage	MOTORSHIP Per Year
New York to Liverpool and return; Rate \$11.00 per ton 5.3 voyages per year	Cargo-tons....	17,680	93,704	19,030	100,859
	Earnings.....	\$194,480	\$1,030,744	\$209,330	\$1,109,449
New York to Buenos Aires and return; Rate \$15 per ton; 4.1 voyages per year.	Cargo-tons....	16,120	66,092	18,450	75,645
	Earnings.....	\$241,800	\$991,380	\$276,750	\$1,134,675
New York to South Africa and return; Rate \$24 per ton; 3.4 voyages per year	Cargo-tons....	14,890	50,666	18,030	61,302
	Earnings.....	\$357,360	\$1,215,984	\$432,720	\$1,471,248

Expenses are made up of items that may be classified as fixed charges and operating charges, but a better division is that in which all expenses of annual nature, independent of the cargo handled or number of voyages, are grouped together as *fixed annual expenses*, and all other items combined in another group, as *service expenses*.

Fixed annual expenses include interest, depreciation (including obsolescence), maintenance, loss and damage, crew wages and subsistence, water and stores. *Service expenses* include fuel, cargo handling, insurance and port charges.

Interest, depreciation and *obsolescence* can be treated as one item—the investment charges fixed by definite annual per cent of the first cost of the ship. Such a motorship as is here considered is valued at \$1,950,000 and the steamship at \$1,800,000. Values for the rate to be applied to the investment differ widely, some figures being as high as 10 per cent for depreciation and obsolescence, and 6 per cent interest, but usually the high figures are based upon an assumption of short life of machinery, or on a desire to write off on the books the value of the ship as soon as possible, as a matter of accounting policy.

Basing a figure on the estimated life of the ship taken at 20 years and carrying the account for the full time, it is possible to charge interest at 6 per cent on the decreasing book value and to depreciate or obsolesce the investment at 2 per cent for the first year; thus, keeping a constant total of 8 per cent per year, write off the account in twenty years. On this basis, the annual investment charge is $0.08 \times \$1{,}800{,}000 =$ \$144,000 for the steamship and $0.08 \times \$1{,}950{,}000 =$ \$156,000 for the motorship, leaving a difference of \$12,000 against the motorship.

Maintenance includes both material and labor required for the upkeep of the ship and machinery over what the regular crew can accomplish. Considerable information is available on the maintenance cost for steam vessels with Scotch boilers and reciprocating-engines, indicating that a fair figure for a 10,000 tons ship would be close to \$10,000 per year for machinery, a considerable part being chargeable to boilers, and at pre-war rates. Similar information collected from motorship owners indicates that a correspondingly fair figure for Diesel machinery of modern design would be about \$8000 per year.

Very little information is available for geared-turbine steamers, but it seems fair to assume that the upkeep cost would be less than for reciprocating engines. In view of the fact that most of the expense is due to boilers, it seems that the fair proportionate figure would be \$8000 for the geared-turbine against the \$10,000 for the reciprocating-engine.

These figures indicate that the maintenance of the machinery of the motorship and geared turbine steamship with Scotch boilers is about the same, and about \$8000 per year at pre-war rates, or \$20,000 at present prices of supplies, wages of shipyard and machinery labor, and present output per man. To this must be added maintenance charges for the ship, fittings, and deck gear, which it is assumed will bring the total to \$50,000 per year for both ships or \$5 per d.w.t. per year.

Crew wages and *subsistence* charges are based on assumed complement and rate of wages, with allowances of \$1.00 per day per man for subsistence. The crew is divided into three groups; (a) deck, (b) steward, these two being the same for steamship and motorship, and (c) engine, in which there are some differences. A careful study of the situation has led to the adoption of the following Table VIII. for the engine crew for the 10,000 tons vessels under consideration.

TABLE VIII

Engine Crew Wages and Subsistence

Position or Title	Wages per Man	STEAMSHIP Number	STEAMSHIP Wages per mo.	MOTORSHIP Number	MOTORSHIP Wages per mo.
Chief Engineer	\$346.25	1	\$346.25	1	\$346.25
First	235.00	1	235 00	1	235.00
Second	206.00	1	206.00	1	206.00
Third	182.50	1	182.50	1	182.50
Deck	182.50	1	182.50	1	182.50
Junior	150.00	...	.....	4	600.00
Oilers	95.00	3	285.00	4	380.00
Wipers	90.00	3	270.00	...	.....
Water Tenders	95.00	3	285.00	...	.....
Firemen	90.00	3	270.00	...	.....
Total	\$1,772.25	17	\$2,262.25	13	\$2,132.25

These men make up three watches, and a day working party, each of which has the following complement:

GROUP	STEAMSHIP	MOTORSHIP
Watch	1 Senior Engineer in engine-room 1 Oiler in engine-room 1 Wiper in engine-room 1 Water Tender in boiler-room 1 Fireman in boiler-room	1 Senior Engineer 1 Junior Engineer 1 Oiler
Day Working Party	1 Deck Engineer	1 Deck Engineer 1 Junior Engineer 1 Oiler

The steamship monthly wages for engine crew of \$2262.25 is equivalent to $12 \times 2262.25 =$ \$27,147 per year, to which must be added subsistence for 17 men at \$1.00 per day, or $17 \times 365 =$ \$6205, making the total $\$27{,}147 + 6205 =$ \$33,352 per year.

For the motorship the year wages are $12 \times 2132.25 =$ \$25,587, to which add subsistence $13 \times 365 =$ \$4745, making the total $\$25{,}587 + 4745 =$ \$30,332 per year.

Not only is there a difference in crew cost in favor of the motorship, but the most troublesome class of labor is eliminated—the coal passers and firemen; and the smaller motorship crew of higher class men is very much easier for the chief engineer to manage.

To provide suitable men for this new service, the Worthington Co. is prepared to train men with suitable experience in its shops where the engines are tested complete before installation in ships.

Deck and steward complements are not analyzed in detail here, but are estimated at 16 men in the deck and 10 men in the steward's departments, a total of 26 men. These men will receive in wages \$33,688, to which add subsistence of $26 \times 365 =$ 9490, making the total \$43,178. This, when added to the total for the engine crew makes the grand total of yearly crew expense $\$33{,}352 + 43{,}178 =$ \$76,530, for the steamship, and $\$30{,}332 + 43{,}178 =$ \$73,512 for the motorship.

Stores, exclusive of those covered by subsistence, are estimated on the quantity of one ton per day used in analyzing deadweight, and are priced at the average figure of \$65 per ton for all three departments, engine, deck and steward, and the same for both types of ship. This adds to the annual expense a total of $365 \times 65 =$ \$23,725.

Loss and *damage* estimates seem to be pure guesses, and figures have been called to our attention ranging from \$5.00 to nearly 20.00 per day for ships of 10,000 tons but varying somewhat with freight rates, routes, port conditions and amount of cargo. It is, at any rate, quite the same for the two types of ships, so that any reasonable estimate can be regarded as proper within the scope of such a comparison as this, and it is, furthermore, quite a small item. As time is certainly a factor, the rate assumed is based on days and the figure taken at \$10 per day for both ships. On this basis the item becomes an annual charge of \$3650 per year against each ship.

Water expense based on the crew consumption of about 20 gallons per day per man and about two per cent of the boiler evaporation as make-up for the steamer would be a service charge, were it not for the fact that the steamship port water losses are substantially the same as at sea. It may, therefore, be assumed that both ships will use water continuously at the rates of Table III., which are 13 tons plus 3 tons per day for the steamship and 3 tons per day only for the motorship. The rate to be charged for the water is based on that for water purchased at New York City—\$1.00 per 1000 cu. ft., which in round numbers is three cents per ton (long). This makes the daily costs \$4.00 for the steamer and \$1.00 for the motorship.

Accordingly, the annual water charge for the steamship is $4 \times 365 =$ \$1460, and for the motorship, \$365.

Fixed annual expenses in the aggregate are summarized in Table IX.

TABLE IX

Fixed Annual Expense

ITEM	STEAMSHIP	MOTORSHIP
Investment charge	144,000	156,000
Maintenance	50,000	50,000
Crew wages and subsistence	76,530	73,512
Stores	23,725	23,725
Loss and damage	3,650	3,650
Water	1,460	365
Total	\$299,365	\$307,252

Service expenses all vary with the number and length of voyages, and include the items of fuel, cargo, handling, insurance and port charges. Each expense item can be estimated only on an assumed price or rate and these are subject to natural trade fluctuations, so that any overall result must be checked before using it as a basis of commercial conclusion by applying new prices and rates prevailing at the time and place under consideration.

(*To be concluded in our November issue*)

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Interesting News and Notes from Everywhere

SMALL DIESEL BOAT

A 56-ft. passenger-launch has been built in Scotland and equipped with a 50 b.h.p. Polar two-cycle Diesel engine.

WORLD'S LARGEST CONCRETE MOTORSHIP

The displacement of the motorship "Cochinchine" (3,200 tons, d. w. c. described in our September issue) is 4,552 tons.

NORWEGIAN MOTORSHIP "EXPEDIT"

The keel of the large Werkspoor-engined motorship "Expedit" ordered by Sigval Bergesen of Stavanger, Norway, was due to be laid during Sept.-Oct. of this year.

ERRATUM

Through a printer's error, a paragraph belonging to the "Katherine" article on page 817 of our September issue was inserted at the end of the "Chas. Gawthrop" article on page 829.

EXPRESS RIVER MOTORSHIP SERVICE

A service of fast motorships is to be placed on the River Danube between Vienna and Belgrade by a company known as the River Syndicate, which has obtained control of navigation on this big river.

LAMPORT & HOLT MOTORSHIP

Two 1,800 i.h.p. British-built Burmeister & Wain type Diesel-engines will be installed in the 10,500 tons d.w.c. motorship previously reported as being built for Lamport & Holt, the well-known British shipowners.

SCOTTISH MOTOR FISHING VESSELS

According to reports just issued by the Scottish Fishery Board there were 1,844 motor fishing vessels registered in Scotland up to the end of 1919—a gain of 326 in twelve months. Evidently there is an excellent market for American oil-engines of 10 to 300 b.h.p.

TWO-500 H.P. DIESEL ENGINES WANTED

We know of a shipping man who is in the market for very early delivery of two 500 h.p. Diesel-type marine oil-engines. If any firm has such motors for disposal we would be glad to forward letters addressed to Box 379, care Editor "Motorship."

SULZER-DIESEL ENGINES UNDER CONSTRUCTION

We have been advised by Sulzer-Freres that together with their licensees there are now on order ten Sulzer two-cycle type merchant-marine Diesel engines of 1,600 to 1,800 shaft h.p. and ten engines of 1,200 to 1,400 shaft h.p. for passenger-liners and cargo-vessels now building.

FRENCH SURFACE-IGNITION OIL-ENGINE TESTS

A series of tests of surface-ignition oil-engines suitable for fishing-boats is about to be held by the Automobile Club of France, in co-operation with the "Ligue Maritime" and the Fisheries Department. Power must be between 20 and 28 b.h.p. at 350 r.p.m., but a difference in speed of 20 per cent either way will be allowed.

AGENTS FOR MOTORSHIP "ANSALDO SAN GIORIGIO I"

The motorship "Ansaldo San Giorgio I," illustrated and described elsewhere in this issue was consigned to McDonnell & Truda, 5 State St., New York City.

U. S. SHIPPING BOARD EMERGENCY FLEET CORP. AND MOTORSHIPS

We understand that since Rear-Admiral Benson has been placed at the head of the U. S. Shipping Board very considerable activity in connection with Diesel-engines and motorships has been shown by the U. S. Emergency Fleet Corp. at Philadelphia, and that there is considerable activity in connection with the construction of motorships under the old appropriations and with the Diesel-engines now on order. Also Mr. Hubert Verhey, formerly Engineer-in-Charge of the Diesel engine department of the Emergency Fleet Corp., is once more back in his old position.

BRITISH ADMIRALTY EXPERIMENTS WITH DIESEL ENGINES

Unfortunately, owing to pressure on space we have been obliged to hold over the second installment of Engineer-Commander C. J. Hawkes' interesting treatise on British Admiralty experiments with Diesel engines until our November issue.

THREE MOTORSHIPS FOR PACIFIC STEAM NAVIGATION CO.

Referring to the several articles on motorships now under construction in Great Britain for British shipowners published elsewhere in this issue, we understand that the Pacific Steam Navigation Company, Ltd., who recently took delivery of their first motorship "La Paz," have two additional motorships of 10,000 tons d.w.c. now under construction at Harland & Wolff's Clyde yards.

DENNY BROS. BUILD MOTORSHIP

We understand that a large motorship is under construction at the yard of Wm. Denny & Bros. of Dumbartonshire, Glasgow, Scotland, to the order of the British India Steam Navigation Co., Ltd.

GERMAN MOTORSHIPS FOR SHIPPING BOARD

We understand that two German built Diesel-driven tankers were allocated to the U. S. Shipping Board some time ago. These vessels have been overhauled by Hawthorne & Co., Ltd., of Leith, and by John Cran & Somerville Ltd., and are practically ready for trials. The work has been superintended by Mr. J. L. Wallace of E. K. Wallace & Sons of Glasgow, Scotland, Superintendent of Repairs for the U. S. Shipping Board.

COSTA RICAN MOTORSHIP

A wooden motorship of 300 tons d.w.c. named "Rosana" has been built in Costa Rica. This is the first attempt at ship construction in that country.

SWEDISH GOVERNMENT SUBSIDIES TO MOTORSHIPS

The sum of 300,000 kroners has been contributed towards a Diesel-driven motorship ordered from the Kockums Shipyard by the Svenska Lantmannens Rederi. The sum of 600,000 kroners has been received by the Rederiaktiebolaget Transatlantic towards the motorships ordered from the Göta and Lindholmens shipyards. The Nordstejernan Steamship Co. of Stockholm, also has received a subsidy in respect to the motorship "Buenos Aires" illustrated on page 801 of our September issue.

MOTORSHIP "FRITZOE"

On page 720 of our August issue we referred to a motorship of 10,000 tons d.w.c. which had been launched by the Rosenberg yard at Tonsberg, to the order of the A/S Fritzoe. We think there must be some error in connection with the same and that this refers to the motorship "Fritzoe," 690 tons gross, built by the A/S Nes. Mekvaerks, of Tonsberg, for the A/S Fritzoe Company of Lauriv, Norway. In this vessel, a 6-cylinder, 18⅞ bore by 29½ in. stroke, Burmeister & Wain Diesel-engine has been installed.

OPERATING AN OIL-FIRED STEAMER UNDER PRESENT FUEL CONDITIONS

During the early part of August the Dutch steam-driven cargo vessel "Elkman," 12,000 tons d.w., propelled by one 4,500 i.h.p. steam-engine took aboard a bunker of Diesel fuel-oil instead of the regular boiler oil. Her fuel-consumption is 40 tons per day. The cost to operate this ship under such conditions can well be imagined. Were she equipped with the Diesel-engines, her fuel-consumption would only be 14 tons per day. Obviously the motorship can afford to pay a much higher price for oil than the steamer.

MAIDEN VOYAGE OF THE "NARRAGANSETT"

The Vickers-engined motorship "Narragansett" of 10,500 tons d.w.c., which recently visited America and which was described and illustrated in our issue of July last, averaged a speed of 11.1 knots fully loaded on her return voyage, distance being 4,528 miles. Her 2,500 shaft h.p. Diesel-machinery consumed a total of 157 tons of oil-fuel. She also has steam-boilers for the auxiliary machinery and the same used 46 tons, or nearly one-third of the amount used by the main Diesel-engines, illustrating the economy of Diesel-electric drive for auxiliary machinery.

EXPERT MOTORSHIP SUPERINTENDENT-ENGINEER

One of our readers is a marine-engineer of wide Diesel-engine and motorship experience and is desirous of undertaking the superintending of the construction and operation of large motorships on behalf of some prominent American firm. He is a Clyde-trained man with three years' steamship experience at sea, two years motorship experience at sea, three years drawing-office designing and estimating, and two years as surveyor and assistant-engineer. We would be very glad to give his name and address to any responsible shipowning and shipbuilding firm communicating with the Editor of "Motorship."

Novel Concrete Tank Barges

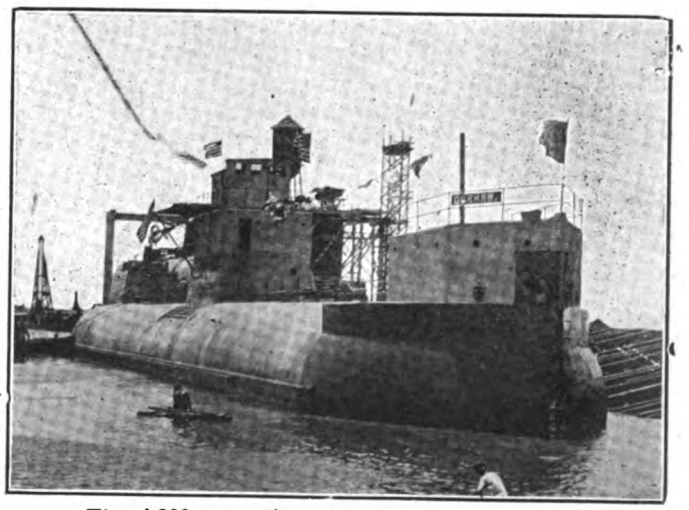
Two Interesting Bolinder-engined Motorships for the France & Canada Oil Transport Company

NOW completing at Aransas Pass, Texas, are two very interesting motor-driven bulk oil carriers of reinforced concrete construction named the "Durham" and "Darlington." These interesting craft are under construction to the order of the France & Canada Oil Transport Co., which, as is fairly well known, is a subsidiary of the France & Canada Steamship Company, which by the way, is associated with the new U. S. Mail Steamship Corp., the head offices of the company being located at 120 Broadway, New York City.

It will be seen from the illustrations that these vessels are of very quaint design and several novel ideas of considerable interest have been devoted in their design, some of which can be clearly seen. The hulls are built in 30 ft. cylindrical sections, each consisting of two interlocking cylinders with connecting slabs forming the keel and deck. Bow and stern are of ship form. They have the following dimensions:

Displacement (loaded)	4,000 tons
Deadweight Capacity	1,900 tons
Cargo Capacity	14,000 barrels
Length	298 ft.
Breadth	33 ft. 8 in.
Depth	21 ft. 10 in.
Draught (loaded)	17 ft. 8 in.
Draught (light)	9 ft.
Power	320 shaft h.p.
Speed	6½ knots

These barges are both self-propelled and each of them are equipped with two four-cylinder 160 shaft h.p. Bolinder surface-ignition two-cycle type direct-reversible heavy-oil engines. We anticipate the trials of these boats will be run very shortly, at which time we hope to give further details and illustrations.



The 4,000 tons dispacement concrete oil-tank barge propelled by twin 160 b.h.p. Bolinder surface-ignition oil-engines

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THE KITCHEN MANOEUVRING AND REVERSING RUDDER

By A. McNAB

SINCE the early days of the Romans, our method of steering a ship is an inheritance from the past; the design of the ordinary ship's rudder, as in use today, *has* remained unchanged throughout hundreds of years. The early Roman Navigator had to depend on the galley slave to propel his unwieldy craft, the steering of the vessel being accomplished by the stern sweep or oar, this sweep being an early type of rudder. The ship's rudder as known, and in use today, was later adopted in Roman days even before the introduction of sail as a motive power for ships.

With the advent of steam, Fulton's "Clermont" included the ancient form of rudder as a means of steering. The adoption of the early form of rudder was natural up to, and including the time of the passing of the side-while steamer, however, with the advent of the screw-propeller as a means of propulsion, conditions in the steering and maneuvring of a ship were completely changed, but even although there was such an opportunity for great improvement, the old form of rudder remained with us, even with all our far-reaching developments in the design of the modern steamship.

When the steamboat revolutioned water transportation, the side or paddle-wheel was utilized as a means of propulsion, therefore it was necessary to stop the paddle-wheel to stop the ship and reverse the paddle-wheel to go astern. Even today the same manoeuvering of engines and propeller is considered necessary to accomplish the efficient handling of a ship as in the days of the paddle-wheel steamboat.

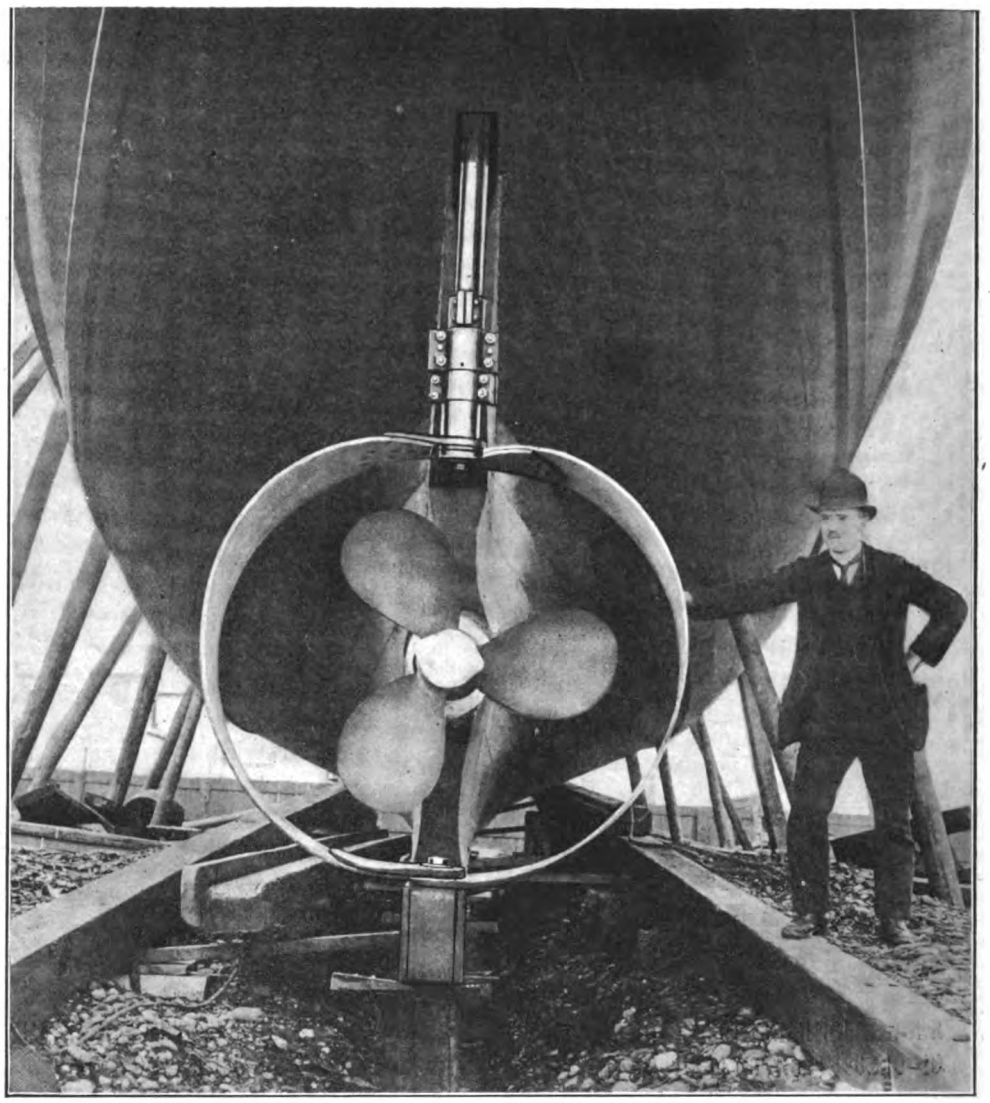
Power to manoeuver and reverse must be possessed by all self-propelled ships, to a greater or lesser extent, whether such craft be motor-boat or ocean motor liner; therefore for ordinary manoeuvers the ancient type of rudder is used. Power for going astern is generally obtained by reversing the propeller direction from that of ahead, with the ordinary rudder this leaves much to be desired for astern manoeuvers. Consequently the manoeuvering ability of a self-propelled ship is clumsy and unweidly, especially in narrow or congested waterways, the reason for this is entirely due to the continued adoption of the ancient form of rudder which is abortive to our modern method of propulsion.

Can it be credited, that throughout the past fifty years, since paddle-wheels were superseded by the screw-propeller, opportunity was given us to put a ship through such manoeuvers, as never before known in the history of navigation.

Recent developments have proved, that without alteration to propelling machinery, except in the simplifying of the propelling unit, a ship can be manoeuvered at from zero to full-speed ahead, brought to rest from full-speed ahead to dead stop practically in her own length, made to rotate on own axis, without progression, either to port or starboard as desired, and made to go astern; this with the engines and propeller running in one direction, full ahead at all times, and that such manoeuvers are accomplished direct from the steering position without interfering with the continued ahead engine and propeller speed or direction.

The ingenious form of manoeuvering and reversing rudders involved by Mr. J. G. A. Kitchen in 1914, for which patents have been granted throughout the world, was so important that the British Government did not allow the design of these rudders to become public knowledge or placed commercially upon the market until after the Armistice. Very complete tests of the Kitchen reversing rudder were made by the British Admiralty.

Technical details of this rudder were given in "MOTORSHIP" of October, 1919. As mentioned in the last issue the McNab Co., of Bridgeport, are handling the Kitchen rudder in the U. S. A. Through an error it was referred to in the heading as a reversible propeller.



Kitchen Reversing Rudder Fitted to an 80-ft. Motor Fishing-Vessel of 76 b.h.p.

A BRITISH SHIPPING FINANCER'S OPINION

Speed is without doubt the most costly single item in a ship. By reducing the speed of a liner from 18 knots to 16 knots they halved the fuel-bill. By substituting oil-fuel for coal they halved it again, and before very long we shall get back almost to the pre-war economic position with internal-combustion engines. The oil-engine had made immense strides, and I have no hesitation in saying that within five years we shall be holding a similar gathering to the one which I am addressing, in order to celebrate the launching of a passenger-liner driven by internal-combustion motors.—*Sir Thomas Fisher* (Chairman, Canadian Pacific Ocean Service.)

SHIPPING BOARD ORDERS MORE FUEL OIL

An order for six-million barrels of fuel-oil at $1.25 per barrel, and an order for nine million barrels of crude-oil at the same price, with gravities of 15 and 25 degrees respectively have been placed by the United States Shipping Board with the Atlantic Gulf Oil Corporation. This fuel is to be delivered over a period of one year beginning about Jan. 1st next at Tecomat, Mexico. This makes a total of 41,000,000 barrels of oil recently ordered by the U. S. Shipping Board.

MERCHANT-SHIP CONSTRUCTION UNIVERSITY COURSE

Readers of "Motorship" whose thoughts are turned towards the education and future of their sons will do well to study the merchant-ship construction course of the Lehigh University, Bethlehem, Pa. The four years' course is as follows:

THE COURSE IN SHIP CONSTRUCTION AND MARINE TRANSPORTATION

Freshman Year

First Term
- Advanced Algebra (3)
- Elementary Chemistry (2)
- Chemical Lab. (2)
- Elementary Mechanics (3)
- French (3) or Spanish (3) or German (3)
- Engineering Drawing (3)
- Construction (2)
- Gymnasium (1)

Second Term
- Plane Analytic Geom. (3)
- Spherical Trigonometry (1)
- Qualitative Analysis (3)
- Stoichiometry (1)
- Elem. Mech. & Heat (3)
- Physical Measurements (1)
- French (3) or Spanish (3) or German (3)
- Engineering Drawing (2)
- Construction (2)
- Gymnasium (1)

Summer Term: Land and Topographic Surveying

Sophomore Year

First Term
- Differential Calculus (4)
- Electricity & Magnetism (3)
- Mechanics & Heat Lab. (1)
- English (3)
- French (3) or Spanish (3) or German (3)
- Economics (2)
- Ship Construction (3)
- Physical Education (1)

Second Term
- Solid Analytic Geom. & Integral Calculus (4)
- Light & Sound (3)
- Light, Elec. & Mag. Lab. (1)
- English (3)
- French (3) or Spanish (3) or German (3)
- Naval Architecture (2)
- Accounting (2)
- Ship Construction (2)
- Physical Education (1)

Summer Term: Work in Shipyard on Hull Construction

Junior Year

First Term
- Strength of Materials (4)
- Strength of Materials Lab. (1)
- Naval Architecture (3)
- Dynamos & Motors (2)
- Dynamo Lab. (1)
- Heat Engineering (3)
- Business Law (2)
- Astronomy & Navigation (2)
- Physical Education (1)

Second Term
- European History (3)
- Hydraulics (3)
- Hydraulic Lab. (1)
- Alternating Currents (2)
- Dynamo Lab. (1)
- Marine Engineering (3) including Diesel Engineering
- Steam Engineering Lab. (1)
- Finance (2)
- Machine Design (3)
- Physical Education (1)

Summer Term: At Sea or in Shipyard Machine Shop

Senior Year

First Term
- Naval Architecture (2)
- Ship Design (3)
- Marine Engines & Turbines (4)
- Steam Engineering Lab. (1)
- Structural Steel Design (4)
- Foreign Exchange & Marine Insurance (3)
- Industrial Management (2)
- Physical Education (1)

Second Term
- Metallurgy (3)
- Ship Design (4)
- Reinforced Concrete (3)
- Contracts & Specifications (2)
- Foreign Trade (4)
- Shipyard Plants & Terminal Facilities (3)
- Physical Education (1)

Dr Laurence B. Chapman is the Professor of Naval Architecture of the Lehigh University. For some time Dr. Chapman was with the New London Ship & Engine Co., the well-known marine Diesel-engine builders.

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Our Readers' Opinions

(The publication of letters does not necessarily imply Editorial endorsement of opinions expressed)

TWO-CYCLE VERSUS FOUR-CYCLE

To the Editor of "Motorship,"

Sir:

In my recent contribuiton to your journal I mentioned that I was preparing an answer to the article by Messrs. Sulzer Freres. However, I notice in your August number an article of the Sulzer company with many informations that partly contain the answers to my intended considerations. So, let us wait for the new two-cycle Sulzer-engined ships to be placed in service.

Meanwhile, let me approve the occasion by congratulating you on the high position of your magazine and the valuable information given to its readers.

Yours very truly,

OTTO ALT.

Krupps Germaniawerft,
Kiel Gaarden, Germany.

To the Editor of "Motorship,"

Sir:

In the August number of Motorship, Sulzer Bros. have made a reply to my criticism as well as the criticism by Mr. Richardson, in reference to their article appearing in March and April issues of your journal, in which these builders made certain claims as to superiority of their two-cycle Diesel engine over the four-cycle for cargo vessels. It was interesting, as well as significant, to have had my criticism of these claims independently corroborated by an English engineer.

Evidently to substantiate their claim as experienced builders of machinery for the type of vessel under consideration, on page 729 of the August number is given a list of ships equipped with Sulzer engines. These, as will be noted, consist chiefly of tug-boats, sailing-vessels, and miscellaneous small coasting and river boats. Of the 83 so listed only 11 can be designated as real deep sea motor-ships, and with which class the present discussion is only concerned. Also, of this eleven the "Sabara" (the performance of which has been previously discussed), is the only one listed in Lloyds, from which we would assume that the others are either very new, are under construction, or on order.

Sulzer Bros. have taken exception to my statement that the two-cycle is not as adaptable as the four-cycle engine to higher revolutions, which would have been clearer if stated as piston-speed. The correctness of this is appreciated if the short time interval for scavenging of the two-cycle is compared to the full exhaust-stroke of the four-cycle engine. It is to be noted that Sulzer, as well as other similar two-cycle engine builders, designs for about 600 feet piston-speed, whereas the makers of the larger four-cycle engines are using about fifty per cent higher speed.

Accordingly, in their hypothetical comparison of a two and four-cycle installation, Sulzer Bros. have made their initial error in choosing the piston-speed too low for the four-cycle. The revolutions are also too low for the four-cycle, and in this connection the experience of Burmeister & Wain (who are experienced ship-builders as well as engine-builders), might be cited. This is that a very high mean propulsive-efficiency can be obtained with twin-screws with higher revolutions than usually heretofore considered standard practice. This is on account of better immersion of propellers under all weather and draft conditions and their proper co-ordination with after part of the hull.

Sulzer Bros. say they are old builders of four-cycle engines, presumably for land purposes, and from their experience so gained have adopted the two-cycle. This is decidedly contrary to similar experience of Franco Tosi, Ltd., who have abandoned the two-cycle for the four-cycle. It might also be cited that McIntosh and Seymour decided to develop a four-cycle engine for marine purposes in preference to the two-cycle Polar engine, for which they have a license to build in this country.

To show Messrs. Sulzer Bros. that the criticism was not necessarily directed against their two-cycle engine, of which they complain, the actual performance of another two-cycle engined vessel by another maker can be pointed out showing the discrepancy when compared with its designed conditions. This is the M/S "Hamlet," equipped with Polar two-cycle engines, using port-scavenging and with only one valve-port in center of the cylinder-cover, similar to Sulzer design, and concerning which the latter claim certain advantages.

The data is taken from Motorship, December issue of 1918, and a paper read by Mr. E. Hedén before the Swedish Engineering Society last November. The designed speed is 13 knots, when the two engines are supposed to develop 3,300 b.h.p. at 120 r.p.m. On the first voyage to America, only half loaded, the average speed was about 10 knots with a mean r.p.m. of 103 and i.h.p., both engines, of 3,080, which gives a mean indicated-pressure of only 4.4 kg/cm². Mr. Hedén, whose firm built the hull and installed the engines, says that in subsequent service it was found most advantageous to continue (as on first voyage), so as not to strain the machinery.

Referring to the article in "Motorship," it will be seen that in subsequent service the mean speed is slightly less than 10 knots with r.p.m. about 102, and i.h.p. 3,050. The following comparison between M/S "Hamlet" and M/S "Oregon," equipped with four-cycle engines, is given:

	M/S "Hamlet"	M/S "Oregon"
Length, B.P.	356 ft.	405 ft.
Beam	56 ft.	54 ft.
Load Draft	24 ft. 10 in.	25 ft. 6 in.
D.W. Capacity	7,100 tons	8,270 tons
Designed Speed	13 knots	11 knots
Designed Revs.	120 P.M.	140 P.M.
Actual Mean Speed	10 knots	10.5 knots
Actual Mean Revs.	102 P.M.	135 P.M.
Designed B.H.P.	3,300	2,150
Actual Estimated B.H.P.	2,000	2,100
Actual Mean I.H.P.	3,050	2,700
Actual M.E.P.	4.4	6.1
No. Cylinders per Engine	6	6
Diam. of Cylinders	600 mm.	590 mm.
Stroke	900 mm.	900 mm.
Cycle	2	4
Type	Polar	B. & W.

The "Oregon's" engines are the same as were used in the comparison by the writer with the Sulzer installation, and, accordingly, the design was not the creation of the writer's fancy.. It might also be stated that the M/S "Oregon" is the 19th deep sea motor-vessel completed by Burmeister & Wain at their Copenhagen plant, and was put into commission in the Spring of 1916.

Yours very truly,

J. C. SHAW.

C/o Wm. Cramp & Sons Ship and
Engine Bldg. Co.,
Philadelphia, Pa.
Aug. 19th, 1920.

THE OLD SHIPPING BOARD MYSTERY DEEPENS

Sir:—

I feel it hardly necessary to reaffirm to you my views as to the advantage—nay, importance of motor propulsion, particularly so now that we are actually facing the shortage in oil which I had long anticipated.

On the other hand, it is regrettably the fact that our shipbuilders are yet without the necessary facilities or equipment for construction of Diesel-engines. The cost of such propulsion still stands at a very wide spread in comparison with the reciprocating type.

As to the tanker ordered by this company, to which you refer, other considerations came into account, including pressing need for earliest possible delivery, as also the fact that in service from Tampico there are difficulties, complications and uncertainties with respect to securing a grade of oil suitable for Diesel-engines.

As you will recall, I exerted every effort while with the Shipping Board to assure the necessary encouragement for the construction of Diesel-engines in the United States, *but unhappily with practically no success.* In my opinion this is a question of vital importance to the development of our merchant marine.

Yours very truly,

J. H. ROSSETER.

Pacific Mail S.S. Co.,
508 California St.,
San Francisco, Cal.,
Aug. 20th, 1920.

[Mr. Rosseter's remarks regarding his inability to induce the Shipping Board to build motorships while he was "Director of Operations" adds to the mystery regarding the element in the Emergency Fleet Corporation opposed to Diesel power. Regarding the first cost of Diesel-engines mentioned by Mr. Rosseter, it is correct that this is about 30 per cent higher, but the cost of the complete motorship is only about 10 per cent higher, because of the absence of deck piping, etc. However, as a motorship carries from 10 to 12 per cent more cargo than a reciprocating steamer, or 15 per cent on a very long voyage, the cost per net-cargo ton capacity is slightly less. Therefore, in actual fact, a motorship is not more costly to build than a steamer. The most important thing to remember is that a ship is built to carry cargo, not 15 per cent fuel, which is usually included in the first cost per d.w.c. ton. An alternative is to make the motorship smaller and so reduce the first cost per d.w.c. ton and she yet will carry the same amount of cargo as the larger and more expensive steamer.—*Editor.*]

BARGES ON THE N. Y. STATE CANAL

To the Editor of "Motorship,"

Sir:

Having concluded the work of construction and the placing in commission of the fleet of twenty oil-burning steam barges for the New York Canal Section of the Inland Waterways Division of the War Department, which by the way, should have been equipped with motors instead of oil-fired boilers, my services are now available.

It is unfortunate that at least a few of the barges were not put in commission as motor-driven vessels, because conditions which obtain on the canal prevent the procuring of suitable water for boilers at most points along the whole route from New York to Buffalo, and in addition a reduction of crew from five to two men and the usual increases and savings all around, and particularly as the personnel obtained for operation were as readily instructed in motor management as in burning fuel-oil under boilers. In fact, I believe that they would be more readily obtained for this service, from the experiences I have had in getting them.

Yours very truly

C. S. HAWKINS,

9 Mandeville,
Boonton, N. J.

PROPOSED DIESEL ENGINE RESEARCH DEPARTMENT

Sept. 2, 1920.

To the Editor of "Motorship,"

Sir:

The writer would like an expression of your opinion, and a statement of the extent of your own and your publication's co-operation toward the establishment of a Diesel-engine research and training department in one of the leading technical institutions in the East.

The writer has in mind these considerations: Does the future of the Diesel-engine merit such a specialized position in the educational system of the United States, and would the probable results to be achieved, in terms of experimental and constructional data, and personal training, give rise to an interest and co-operation of those interested in the development of the Diesel engine in this country by American engineers and scientists, namely American Diesel engine manufacturers and engineering educators, to the extent of financial support by the first and educational facilities and experimental equipment at their command by the second?

The writer is an undergraduate engineering-student interested in the development of the Diesel-engine by American engineers for the engineering profession who, with the moral support of those interested stands ready to do everything in his power to assist in giving impetus to such a project.

He would be pleased to hear from anyone likewise interested.

Yours very truly,

W. J. LANDWEHR.

558 Skinker Road,
St. Louis, Mo.

[The question is one that our Diesel engine builders will have to decide, as without their wholehearted approval and co-operation such an institution could not be a success.—*Editor.*]

A TYPOGRAPHICAL ERROR

Sir:

With reference to the article on "Air-Injection for High-Pressure Oil-Engines," I regret to note on page 632, column 3 a misprint has slipped into the matter and I shall be obliged if you would draw attention to this fact at an early opportunity.

The formula is quoted as:

D1/3 k.v.n. I

It should read:

D k.v.n. I

Yours very truly,

J. L. CHALONER.

NO MOTORSHIP FOR GARLAND STEAMSHIP COMPANY

There is absolutely no truth in the report published in a contemporary that the Garland Steamship Co. of New York—says Mr. Campion of that firm—is having a number of motorships built. Apparently the report originated at the office of their San Francisco representatives. However, we suggest that Diesel-engine builders get busy and endeavor to make the false rumor a reality.

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